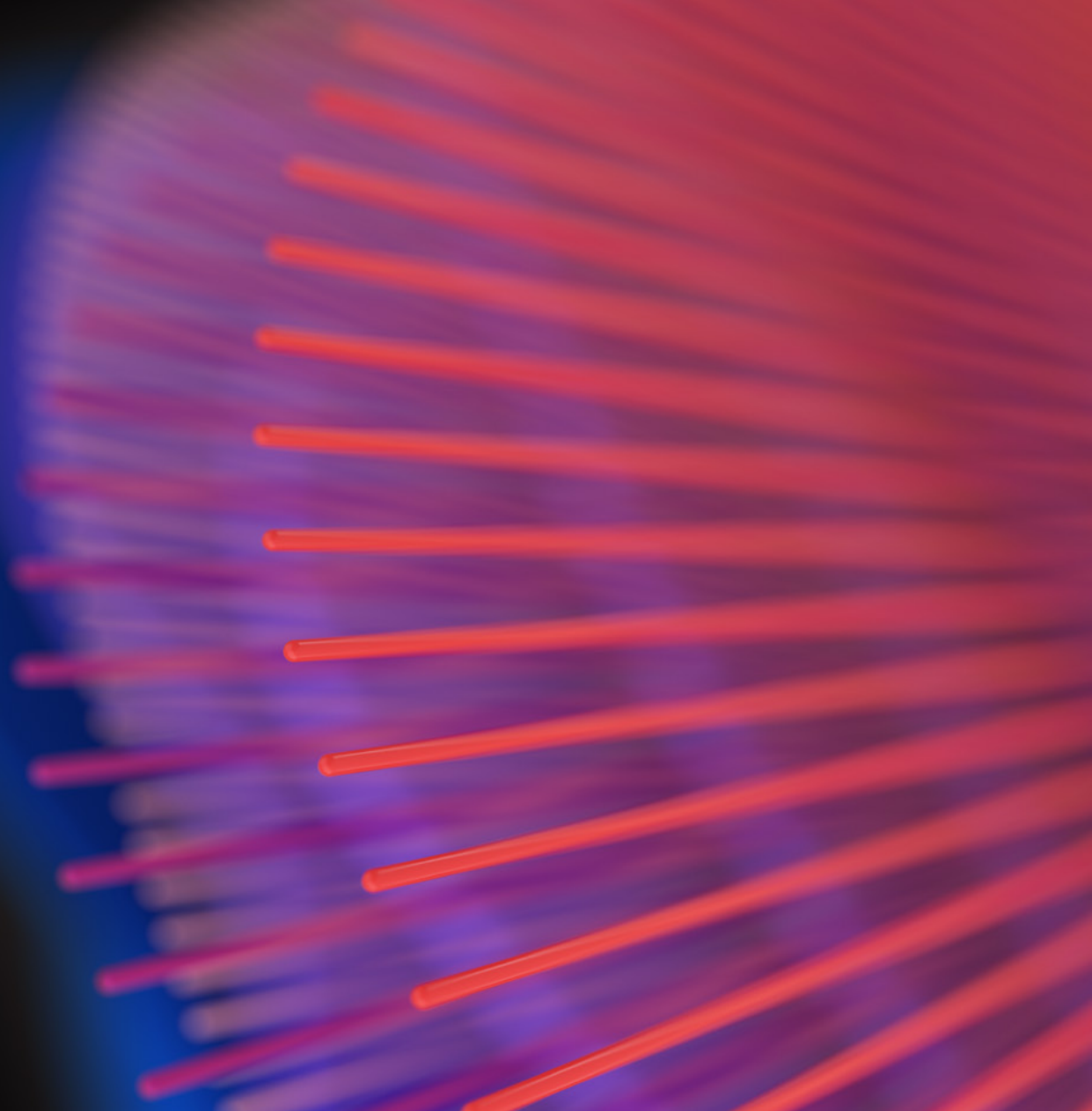


# Council of Scientific & Industrial Research (CSIR-India): Research Output Highlights from Web of Science



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The **Council of Scientific & Industrial Research CSIR-India** is among the world's largest publicly funded research organizations. With a pan-India presence, CSIR-India has a dynamic network of 38 national laboratories, 39 outreach centers, 3 Innovation Complexes and 5 units. The CSIR-India laboratories and units produce significant research across diverse

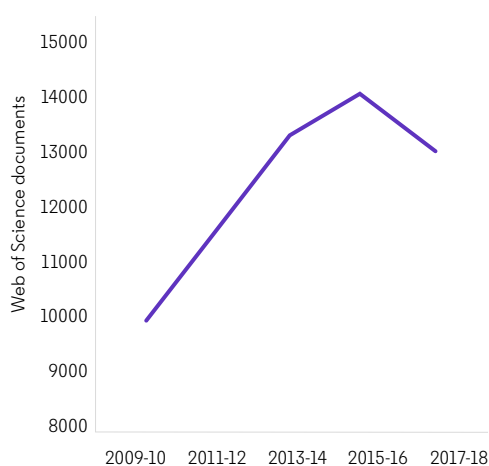
scientific disciplines ranging from radio and space physics, oceanography, geophysics, pharmaceuticals, biotechnology and nanotechnology to mining, aeronautics, instrumentation, environmental engineering and information technology.<sup>1</sup>

This report looks at the research output and trends at CSIR-India between 2009 to 2018.

## Gross research output

**During 2009 to 2018, CSIR produced 62,260 Web of Science (WoS) publications contributing to around 7% of total scientific literature from India during the same period (1A).**

**Figure 1A: Count of publications for CSIR-India (2009 to 2018)**

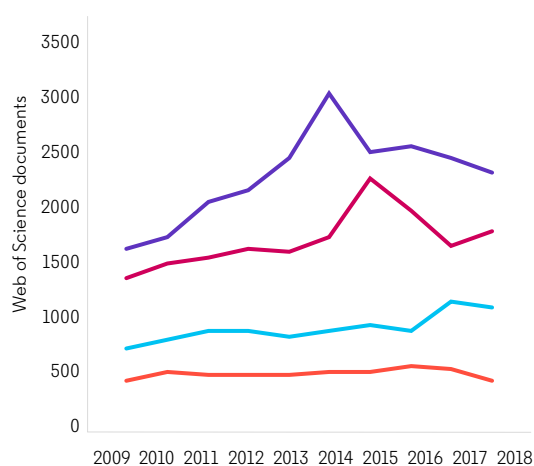


CSIR Publications (2009 to 2018)

Source: Web of Science, InCites Time period: 2009 to 2018

During 2009 to 2018, CSIR-India researchers published 47,396 papers (around 80% of research output) in journals assigned a quartile ranking according to Journal Impact Factor (JIF) -1B. Journals which have been assigned a Journal Impact Factor are amongst the top journals in their field. Journal quartiles rank the journals in a subject area (Web of Science category) from highest to lowest based on their impact factor. There are four quartiles: Q1, Q2, Q3 and Q4. Q1 is occupied by

**Figure 1B: Count of publications for CSIR-India (2009 to 2018)**



CSIR Publications in Q1 journals (2009 to 2017)  
 CSIR Publications in Q2 journals (2009 to 2017)  
 CSIR Publications in Q3 journals (2009 to 2017)  
 CSIR Publications in Q4 journals (2009 to 2017)

Source: Web of Science, InCites Time period: 2009 to 2018

the top 25% of journals in the list; Q2 is occupied by journals in the 25% to 50% group; Q3 is occupied by journals in the 50% to 75% group and Q4 is occupied by journals in the 75% to 100% group.

The journal quartile serves as an indicator of journal quality (eliminating bias for highly cited scientific fields). It is a proxy indicator of research quality, with research being published in Q1 journals being of higher quality etc.

<sup>1</sup> <https://www.csir.res.in/about-us/about-csir>

# Open access publications

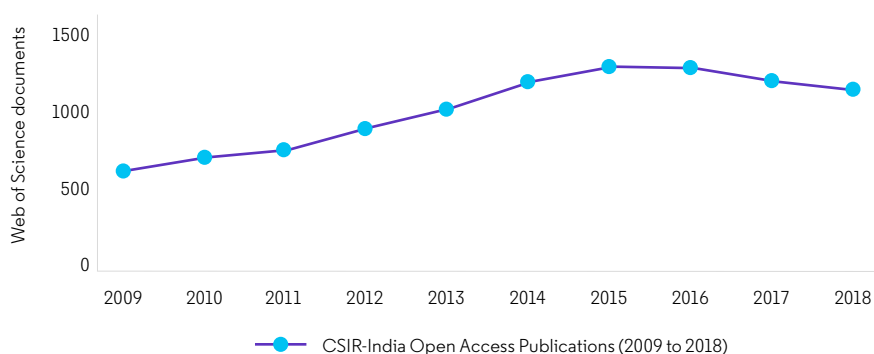
During this period, CSIR-India published 9815 open access papers. Figure 2A shows the year wise distribution of open access papers.

Open access status is provided across the Web of Science platform as a result of a partnership with Impactstory,

a not-for-profit organization that recently launched a knowledgebase of Open Access (OA) content. This knowledgebase makes it possible to discover and link to legal Gold or Bronze (free content at a publisher's website) and Green (for example, author self-archived in a repository) OA versions.

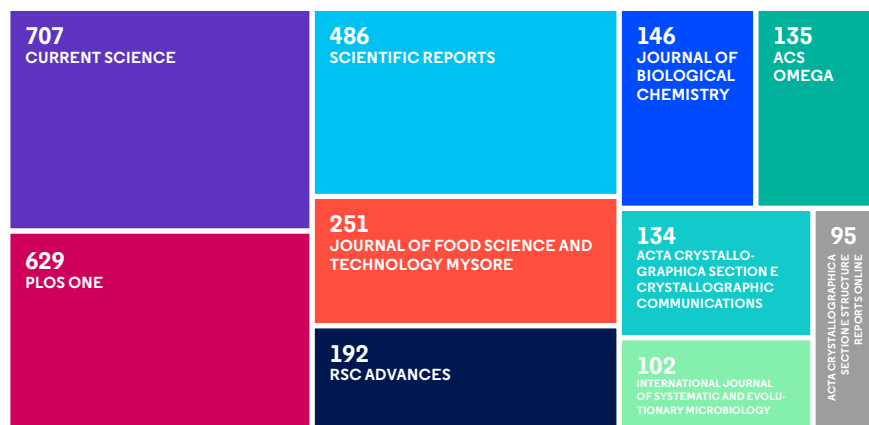
## CSIR-India Open access publications (2009 to 2018)

Figure 2A: Open access publications for CSIR-India (2009 to 2018)



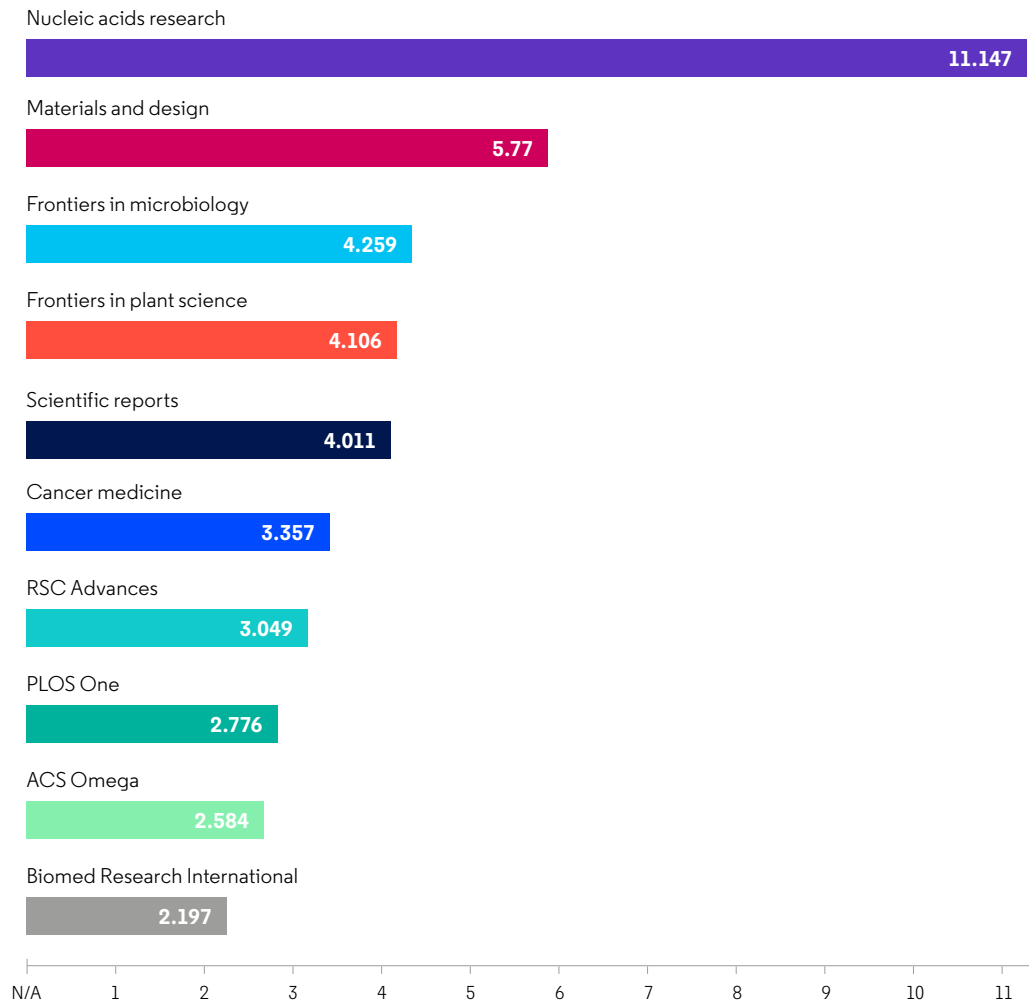
Source: Web of Science, InCites Time period: 2009 to 2018

Figure 2B: Top open access journals for CSIR-India (2009 to 2018) publication volume wise



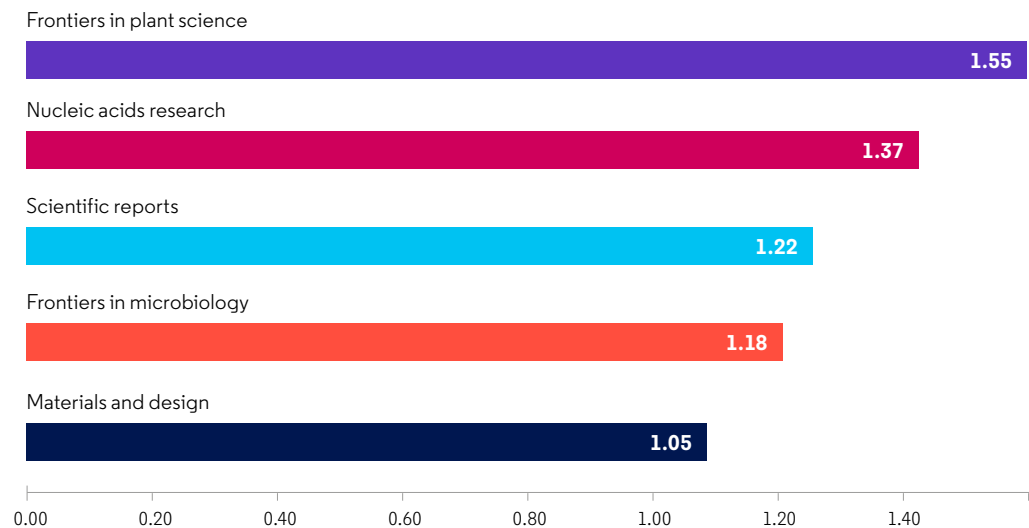
Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 2C: Top 10 Open access journals for CSIR-India per JIF (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 2D: Top 5 open access journals for CSIR-India per CNCI (2009 to 2018)**



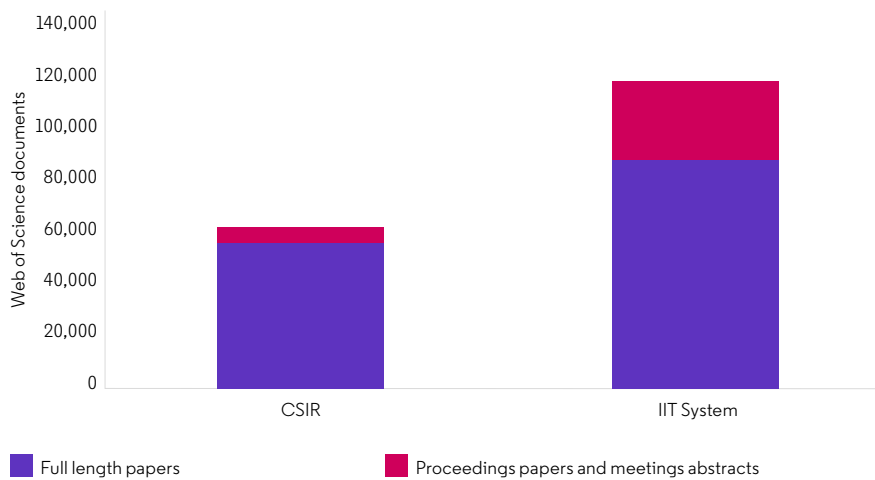
Source: Web of Science, InCites Time period: 2009 to 2018

# Comparison with other institutions

CSIR-India was the second most prolific research producing organization (having 62,260 WoS records) in India in terms of publication volume after the IIT system (having 116,685 WoS records) during the analysis period 2009 to 2018.

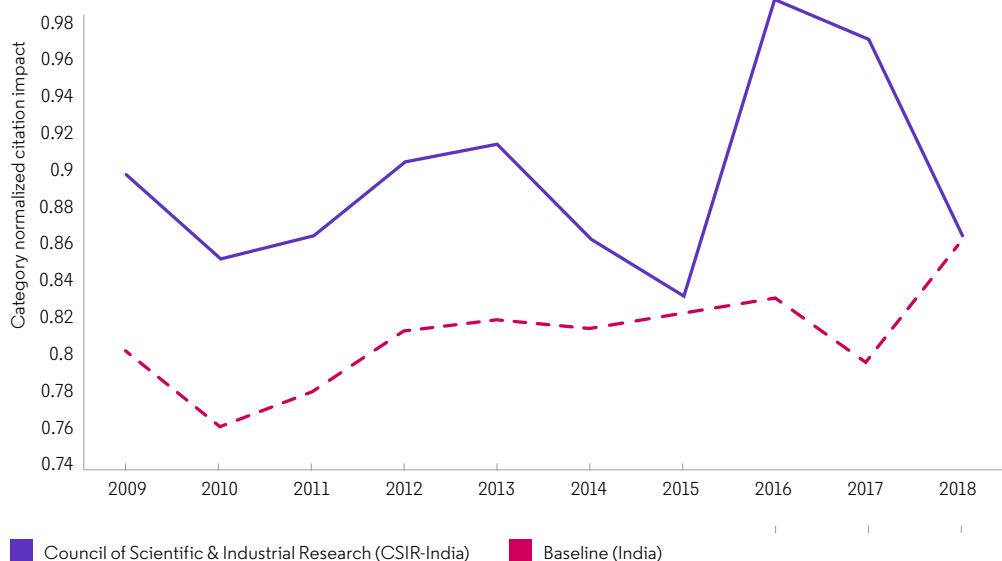
An analysis of the document types published by CSIR-India reveals that more than **90%** of the research output is comprised of full length research papers (articles and reviews), compared to the IIT system where full length papers contribute to just 75% of total research output, rest being proceedings papers and meeting abstracts.

**Figure 3: Comparison of CSIR-India and IIT publications (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 4: Comparison of CSIR-India publications (CNCI) with the national baseline (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Table 1: Comparative research output of five leading Indian organizations (2009 to 2018)**

| Name  | Web of Science documents | Category normalized citation impact | % docs cited | Citation impact | Impact relative to world | Journal normalized citation impact | % International collaborations | % documents in Q1 journals |
|---|--------------------------|-------------------------------------|--------------|-----------------|--------------------------|------------------------------------|--------------------------------|----------------------------|
| <b>Council of Scientific &amp; Industrial Research CSIR-India</b> | <b>62251</b>             | <b>0.90</b>                         | <b>83.36</b> | <b>12.49</b>    | <b>1.53</b>              | <b>0.98</b>                        | <b>18.18</b>                   | <b>41.18</b>               |
| Department of Science & Technology (India)                        | 21250                    | 0.94                                | 82.10        | 13.11           | 1.60                     | 0.93                               | 28.88                          | 50.23                      |
| Indian Institute of Science (IISc) - Bangalore                    | 21416                    | 0.94                                | 75.86        | 10.81           | 1.32                     | 0.88                               | 26.23                          | 50.77                      |
| Indian Institute of Technology System (IIT System)                | 116685                   | 0.96                                | 71.59        | 8.83            | 1.08                     | 0.97                               | 22.03                          | 43.86                      |
| Indian Council of Agricultural Research (ICAR)                    | 25280                    | 0.56                                | 67.87        | 5.68            | 0.70                     | 1.03                               | 11.11                          | 18.24                      |

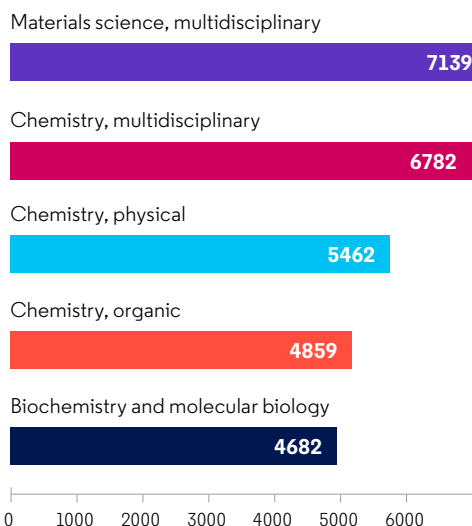
Source: *Web of Science, InCites* Time period: 2009 to 2018

**Figure 4** shows the category normalized citation impact (CNCI) of CSIR-India research in comparison with the output during 2009 to 2018 for articles and review document types. With a CNCI of **0.9**, CSIR-India publications have a better normalized citation impact than the national average of 0.81 during the same period (2009 to 2018). The Category Normalized Citation Impact (CNCI) of a document is calculated by dividing the actual count of citing items by the expected citation rate for documents with the same document type, year of publication and subject area.

**Table 1** shows the research output as measured by the number of publications produced by CSIR-India and four other national institutes of repute for the time period 2009 to 2018. CSIR-India produces the highest percentage of citable research with 83.36% of its documents having received at least one citation. Impact relative to World is the quotient obtained by dividing the citations per document for a selected institution or country by the citations per document for all documents in the selected time period, and being more than one for CSIR-India, it is higher than the global average.

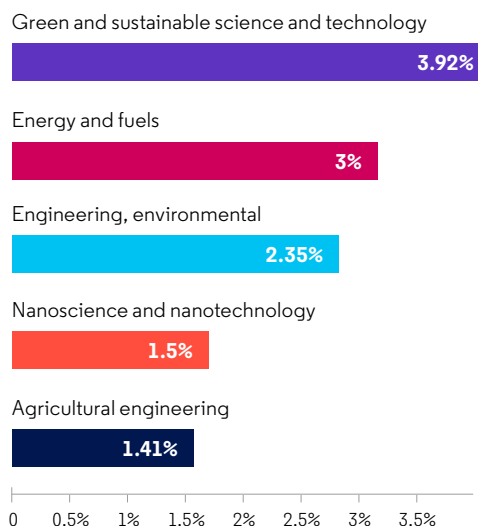
## Analysis of CSIR-India research: top research areas

**Figure 5A: Top research areas based on number of papers by CSIR-India (2009 to 2018)**



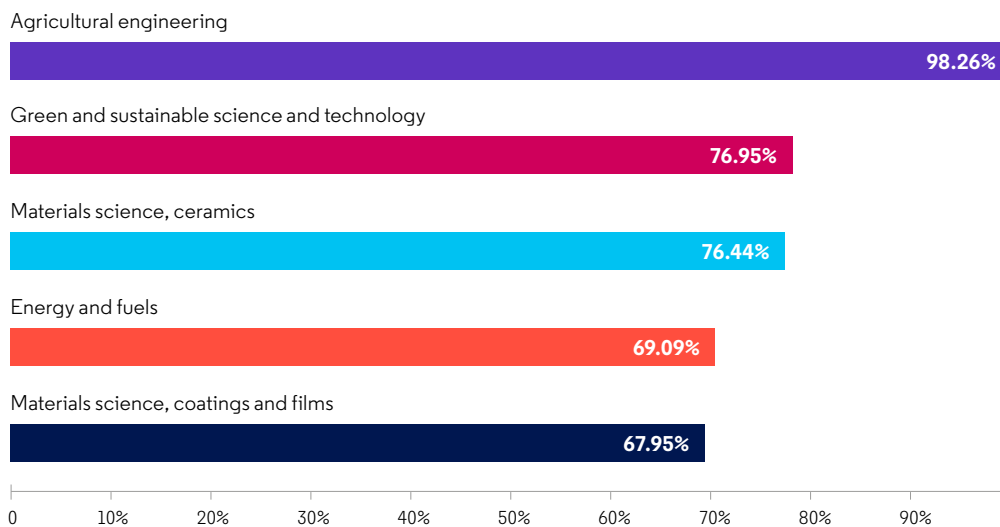
Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 5B: Top research areas based on % of highly cited papers by CSIR-India (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 5C: CSIR-India research areas with highest percentage of publications in Q1 journals (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figures 5A to 5C** show the top productive research areas of CSIR-India.

**5A:** Top research areas at CSIR-India based on number of WoS records.

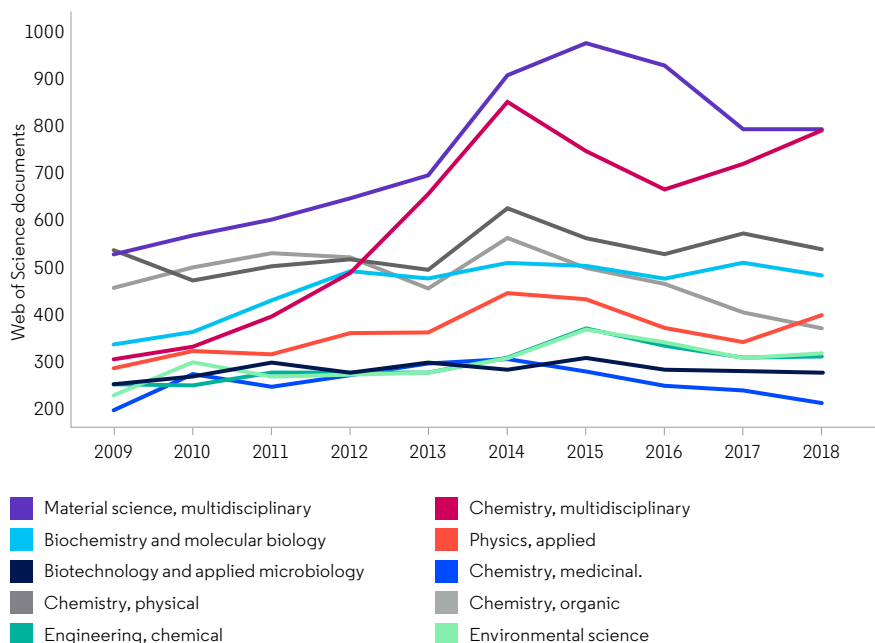
**5B:** Based on % of highly cited papers. They are considered to be indicators of scientific excellence and top research performance that drive innovation.

**5C:** CSIR-India research areas with highest percentage of publications in Q1 journals. Q1 (quartile 1) journals represent the top journals in any scientific discipline. Publishing consistently in Q1 journals is representative of quality of the research conducted.



## Changing research focus and impact of CSIR-India

**Figure 6A: Changing research focus at CSIR-India based on publication volume (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 6A** shows how the research focus of CSIR-India has changed over the past decade (Y axis-number of Web of Science Documents). Research in multidisciplinary chemistry with

applications in batteries, probes, novel materials etc. has gained serious momentum. Overall, researchers at CSIR-India have been focused overwhelmingly on chemistry and related disciplines.

**Figure 6B: Changing impact of research areas based on CNCI (2009 to 2018)**



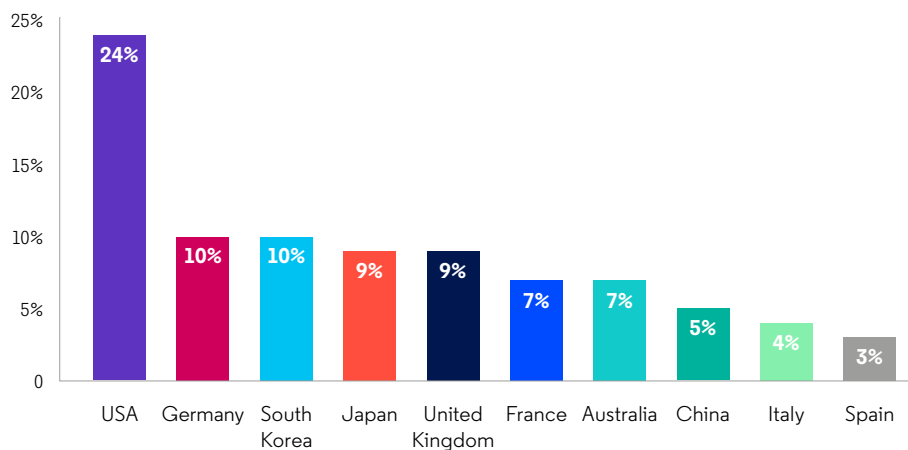
Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 6B** shows the year-wise trend graph of the top research areas at CSIR-India by CNCI. During 2009 to 2018, inorganic and nuclear chemistry was the most impactful research area with a CNCI of 1.35, followed by metallurgy (1.16), energy and fuels

(1.11), and medicinal chemistry (1.08). Energy and Fuels research has gained maximum impact acceleration judging by its CNCI increase over the past year.

## CSIR collaborations

**Figure 7A: Top 10 collaborations: regions or countries with which CSIR-India collaborated most frequently with**



Source: Web of Science, InCites Time period: 2009 to 2018

### Major collaborators for CSIR-according to publication volume:

- Indian Institute of Science
- IIT Madras
- Department of Science and Technology
- University of Delhi
- Anna University
- Department of Biotechnology

**However, in terms of normalized citation impact, the following (Figure 7B) are the most fruitful collaborations with CSIR.<sup>2</sup>**

**Figure 7B: Top impactful collaborations**

| Name   | Country/Region | Web of Science Documents | Category Normalized Citation Impact |
|--|----------------|--------------------------|-------------------------------------|
| Centre National de la Recherche Scientifique (CNRS)      | France         | 892                      | 1.83                                |
| Department of Science & Technology (India)               | India          | 2,293                    | 1.52                                |
| Jawaharlal Nehru Centre for Advanced Scientific Research | India          | 949                      | 1.49                                |
| Banaras Hindu University                                 | India          | 894                      | 1.45                                |
| University of Delhi                                      | India          | 1,654                    | 1.29                                |
| University of Calcutta                                   | India          | 558                      | 1.15                                |

Source: Web of Science, InCites Time period: 2009 to 2018

<sup>2</sup>For collaborations ordered by CNCI-we have considered at least 500 publications

**Figure 8A: Top 10 CSIR-India constituent organizations by publication volume (2009 to 2018)**

| Member labs of CSIR   | Number of WoS records |
|---|-----------------------|
| Indian Institute of Chemical Technology                         | 6610                  |
| National Chemical Laboratory                                    | 4978                  |
| National Physics Laboratory                                     | 3949                  |
| Central Drug Research Institute                                 | 3412                  |
| Academy of Scientific and Innovative Research                   | 2665                  |
| National Institute Interdisciplinary Science Technology (NIIST) | 2184                  |
| Indian Institute of Chemical Biology                            | 2159                  |
| Central Food Technological Research Institute                   | 2133                  |
| National Institute of Oceanography                              | 2000                  |
| Central Salt and Marine Chemical Research Institute             | 1983                  |

Source: *Web of Science, InCites* Time period: 2009 to 2018

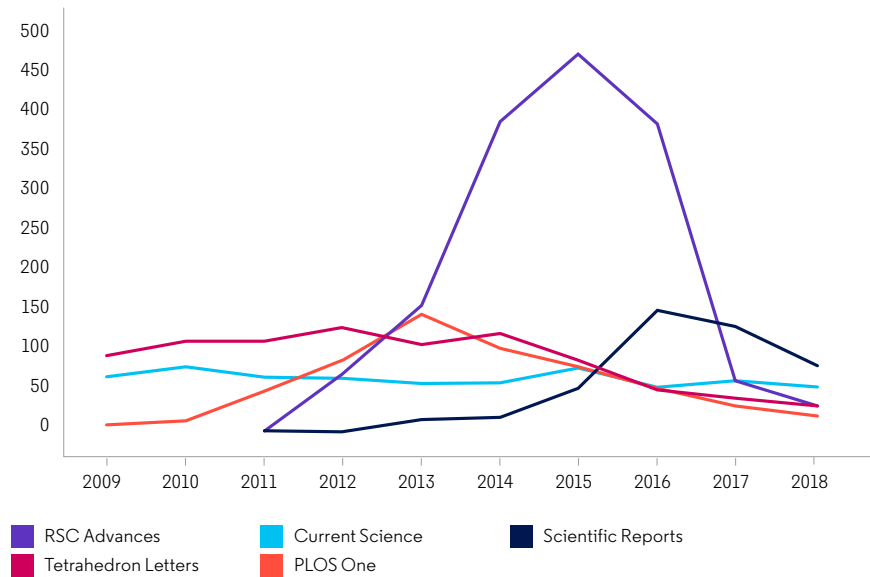
**Figure 8B: Top CSIR-India constituent organizations producing the most impactful research as per CNCI (2009 to 2018)**

| Name  | Category normalized citation impact |
|---|-------------------------------------|
| Indian Institute of Toxicology Research                             | 2.9                                 |
| Centre for Cellular and Molecular Biology – India                   | 1.19                                |
| Academy of Scientific and Innovative Research (AcSIR)               | 1.12                                |
| Central Salt and Marine Chemical Research Institute – India         | 1.11                                |
| Central Electrochemical Research Institute – India                  | 1.1                                 |
| National Chemistry Laboratory Pune                                  | 1.08                                |
| National Institute of Oceanography – India                          | 1.05                                |
| National Institute Interdisciplinary Science and Technology – India | 1.03                                |
| Indian Institute of Chemical Technology                             | 1.03                                |
| Indian Institute of Integrative Medicine (IIIM), Jammu              | 1.02                                |
| Institute of Microbial Technology – India                           | 1.01                                |

Source: *Web of Science, InCites* Time period: 2009 to 2018

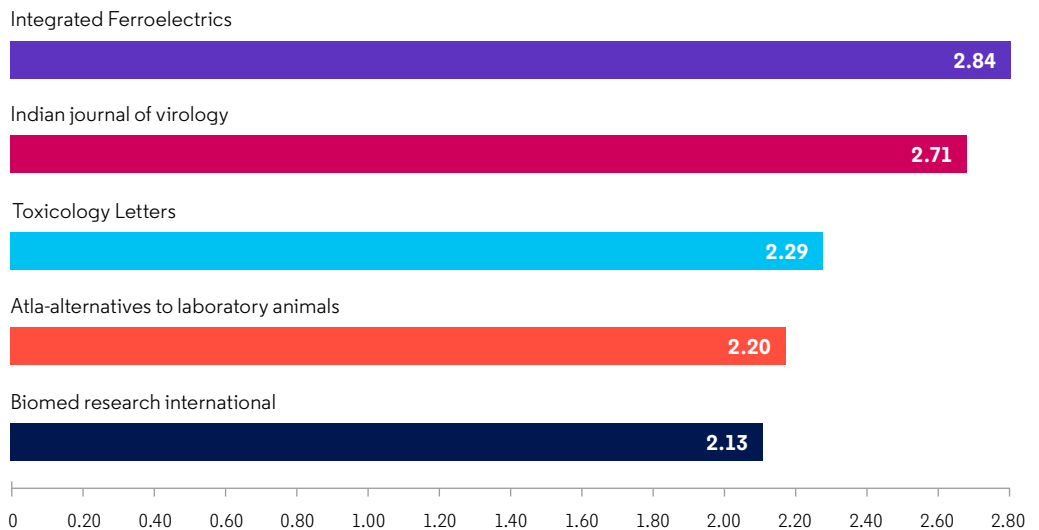
## CSIR-India publication trends

**Figure 9A: Top journals by number of CSIR-India publications (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 9B: Top journals in which CSIR-India produces the most impactful research as per CNCI (2009 to 2018)**



Source: Web of Science, InCites Time period: 2009 to 2018

**Figure 9A** shows the top journals in which CSIR-India researchers have been publishing along with publication trends over the past decade.

**Figure 9B** indicates journals where CSIR-India authors outperformed the average journal citation rate. Thus, in *Integrated Ferroelectrics*, CSIR-India authored papers garnered citations 2.84X the average citation rate for a given document type, subject and publication year.

## CSIR-India publication trends

**Table 2: Top journals in which CSIR-India researchers publish (2009 to 2018)**

| Name                                       | Rank | Web of Science Documents | Times cited | Article influence | Cited half life | Eigenfactor | Immediacy index |
|--|------|--------------------------|-------------|-------------------|-----------------|-------------|-----------------|
| RSC Advances                               | 1    | <b>1,617</b>             | 17,668      | 0.56              | 2.6             | 0.308       | 0.59            |
| Tetrahedron Letters                        | 2    | <b>1,385</b>             | 24,796      | 0.36              | 12.6            | 0.04        | 0.59            |
| Current Science                            | 3    | <b>1,004</b>             | 4,572       | 0.26              | 12.1            | 0.007       | 0.17            |
| PLOS One                                   | 4    | <b>650</b>               | 9,996       | 1                 | 4.3             | 1.862       | 0.41            |
| Bioresource Technology                     | 5    | <b>592</b>               | 19,366      | 0.97              | 6               | 0.109       | 1.11            |
| Scientific Reports                         | 6    | <b>515</b>               | 4,578       | 1.36              | 2.2             | 0.719       | 0.58            |
| Bioorganic and Medicinal Chemistry Letters | 7    | <b>468</b>               | 9,406       | 0.5               | 7.5             | 0.042       | 0.61            |
| Journal of Alloys and Compounds            | 8    | <b>454</b>               | 6,721       | 0.57              | 4.4             | 0.106       | 1.23            |
| Chemical Communications                    | 9    | <b>439</b>               | 11,354      | 1.44              | 5.4             | 0.333       | 1.4             |
| Journal of Organic Chemistry               | 10   | <b>420</b>               | 9,447       | 0.98              | 11              | 0.091       | 1.23            |

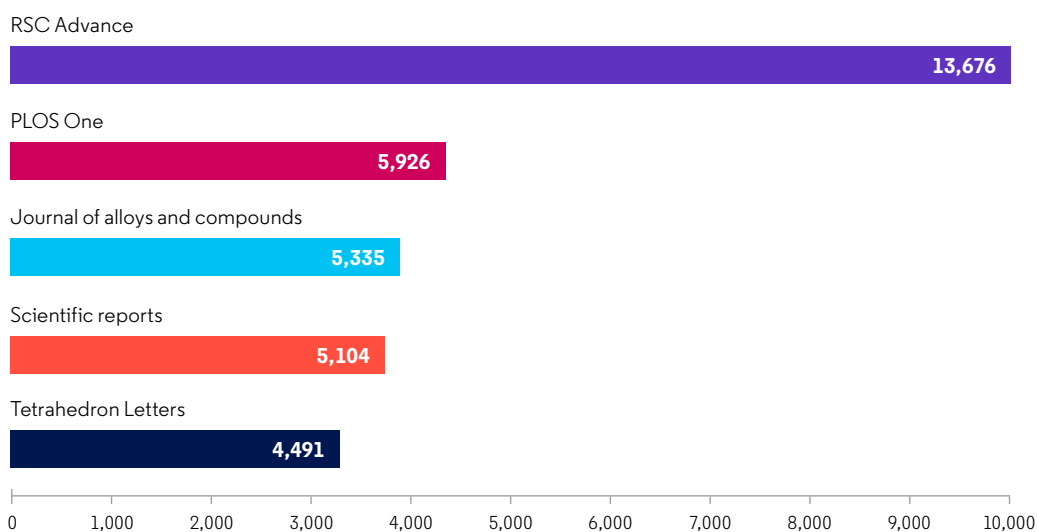
Source: *Web of Science, InCites* Time period: 2009 to 2018

**Table 2** shows the top ten journals in which CSIR-India researchers publish in along with parameters such as Journal Impact Factor, Immediacy Index (average number of times an article is cited in the year it is published-gives an idea how quickly an article will get citations

in a particular journal in the same year of its publication therein), cited half-life (median age of the articles that were cited in the JCR year. Half of a journal's cited articles were published more recently than the cited half-life) etc.

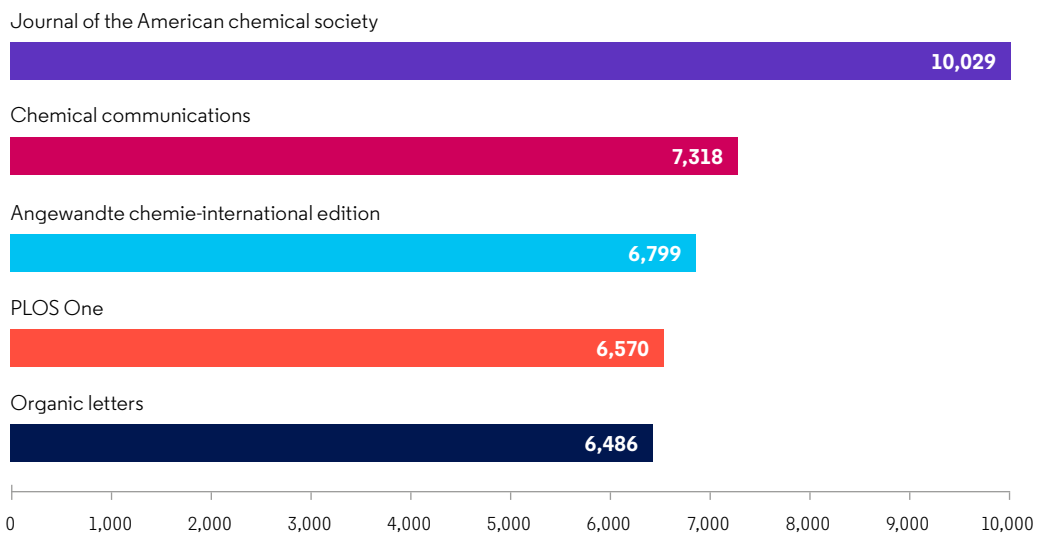
## CSIR-India publication trends

**Figure 10A: Top journals citing CSIR-India authors (2009 to 2018)**



Source: *Web of Science, InCites* Time period: 2009 to 2018

**Figure 10B: Top journals being cited by CSIR-India authors (2009 to 2018)**



Source: *Web of Science, InCites* Time period: 2009 to 2018

Citing journals are ranked by the number of *Web of Science* documents citing CSIR-India publications. Understanding which journals cite CSIR-India publications can help researchers decide where to publish—a journal that consistently cites an organization’s research will be more amenable to publish its research.

Similarly, Cited journals are ranked by the number of *Web of Science* documents cited by CSIR-India.

# Appendix: Methodology

**The above report has been created using data from Web of Science and our benchmarking tool InCites.**

Web of Science, is a premier multi-disciplinary citation indexing database that provides access to an unrivaled breadth of world class research literature for quality research. Web of Science covers a rigorously selected core of journals, ensuring a unique combination of discovery through meticulously captured metadata and citation connections, coupled with guaranteed quality, impact and neutrality. InCites™ is a citation-based research evaluation tool that uses Web of Science data to analyze institutional productivity and benchmark output against peers worldwide.

Citation analysis is an established quantitative methodology for the assessment of the contribution, dissemination and influence of knowledge-exchange within a research area, where the citations to the work of a researcher act as indicator of scientific impact.

For the purpose of this study, we have considered the time period of 2009 to 2018.



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