

**Development of National Database on S&T Output and
Development of National Publication Indicators
on S&T for 2001 and 2006**

Prepared by

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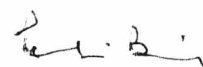
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Forward

The present study entitled “Development of National Database on S&T Output and Development of National Publication Indicators on S&T for 2001 and 2006” was prepared by National Institute of Science, Technology and Development Studies, CSIR, New Delhi under the grants-in-aid project from Department of Science and Technology. The final report presents the progress of Indian science during 2001 and 2006 as reflected through two international bibliographical databases, such as Scopus and Web of Science



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Summary

The report analysis the contribution of Indian science and technology during 2001 and 2006, as reflected in its total publication output covered in two international bibliographical databases, Scopus and Web of Science.

The report describes the size of India's research output and its quality as reflected in impact factor per paper. It also analysis India's global share and rank, as reflected in Scopus and Web of Science databases and also indicates the share of India's publication output in other international subject bibliographical databases, such as Chemical Abstracts (chemical sciences), CAB Database (agricultural sciences), INSPEC database (physics, electronics and computers) and BIOSIS (biological sciences). The report analyses the distribution of Indian science across broad sectors, such as universities and colleges, R&D, Institutes of national importance, industry and others as well across various broad geographical regions. It also identifies the weak and strong areas of Indian science and technology. In addition the report analyses the collaborative nature of Indian research, as reflected in co-authored papers. Finally, the report analysis the contribution of top 15 major Indian institutions, as reflected in their research output and impact.

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(B.M.Gupta)

Contents

- 1. Progress of Indian Science: Analysis of Publication Data covered in Web of Science, 2001 and 2006**
- 2. Progress of Indian Science and Technology: Analysis of Publication Data covered in Scopus Database, 2001 and 2006**
- 3. Indian S&T Statistics from Scopus Database**
- 4. Indian S&T Statistics from Web of Science Database**

**Progress of Indian Science: Analysis of Publication Data covered
in Web of Science, 2001 and 2006**

Progress in Indian Science: Analysis of Publication Data covered in Web of Science, 2001 and 2006

The main objectives of the report are: (i) To study the distribution of S&T output across broad sectors, such as institutes of national importance, universities & colleges, R&D, and Industry; (ii) To identify the areas of strength and weakness of Indian S&T under broad subject fields; (iii) To study the geographical distribution of research output; (iv) To study the quality of research output, as reflected in impact factor per paper; (v) To study the collaborative nature of S&T output; (vi) To analyze institutional productivity and quality; and (vii) To compare the status of Indian S&T publications output with select developed and developing countries, using international multidisciplinary & specialized subject databases.

1. India's Research Output & World Share & Rank

India has published 19479 papers in 2001, which rose to 30970 papers, showing a growth rate of 58.99%. (Table 1)

Table 1. Growth and Impact of Indian Research Output during 2001 & 2006

| Publication Year | No. of Papers | Total Impact Factor | Average Impact Factor per paper |
|------------------|---------------|---------------------|---------------------------------|
| 2001 | 19479 | 24756.1 | 1.27 |
| 2006 | 30970 | 50613.04 | 1.63 |

Table 2. Changing Ranks of the World's Leading Contributors in Publication Output according to the SCIE

| Country | Rank | | | |
|--------------|----------|-----------|-----------|-----------|
| | 1991 | 1996 | 2001 | 2006 |
| USA | 1 | 1 | 1 | 1 |
| China PR | 15 | 13 | 7 | 2 |
| UK | 2 | 2 | 3 | 3 |
| Germany | 4 | 4 | 4 | 4 |
| Japan | 3 | 3 | 2 | 5 |
| France | 6 | 5 | 5 | 6 |
| Canada | 7 | 6 | 8 | 7 |
| Italy | 8 | 7 | 6 | 8 |
| Spain | 12 | 10 | 10 | 9 |
| Australia | 10 | 9 | 11 | 10 |
| India | 9 | 12 | 13 | 11 |
| South Korea | 33 | 20 | 15 | 12 |
| Netherlands | 11 | 11 | 12 | 13 |

| | | | | |
|-------------|----|----|----|----|
| Russia | 36 | 8 | 9 | 14 |
| Brazil | 22 | 22 | 17 | 15 |
| Switzerland | 14 | 15 | 16 | 16 |
| Taiwan | 25 | 19 | 18 | 17 |
| Sweden | 13 | 14 | 14 | 18 |
| Turkey | 38 | 31 | 25 | 19 |
| Poland | 18 | 18 | 19 | 20 |

India's share in world output rose from around 2.3% in 2003 to 2.7% in 2006. Correspondingly, India's world publication rank also improved from 13th in 2001 to 11th in 2006 (Table 2). Similarly, India's share in world output in different subjects as reflected through their international bibliographical databases also showed increase. For example, India's share in world output increased from 6.13% in 2001 to 6.37% in 200 in agricultural sciences (CAB database), from 2.43% in 2001 to 2.47% in biological sciences (BIOSIS database), from 2.50 in 2001 to 3.00% in chemical sciences (Chemical Abstracts database) and 2.34% to 2.66% in physics, electronics & computers (INSPEC database).

The impact of Indian research output has increased from 1.27 in 2001 to 1.63 in 2006 (Table 1). A significant share of Indian research output in S&T was published in low impact journals (IF between 0.001 to 1.999). It was 78.35% in 2001, which declined to 62.53% in 2006. Its share in medium impact journals (IF between 2 and 3.999) has been small (13.57%) in 2001, which increased to 23.29% in 2006. Similarly, its share in high impact journals (IF 4 and above) is even smaller, 5.2% in 2001, which increased to 6.3% in 2006. Besides, India's publication output is also being reported in zero impact journals. Its share in zero impact journals was 2.88% in 2001, which has increased to 7.88% in 2006 (Table 3).

Table 3. Distribution of Indian Research Output by Impact Factor Range, 2001 & 2006

| IF Range | Number of Papers | | Share of Papers | |
|--------------|------------------|-------|-----------------|-------|
| | 2001 | 2006 | 2001 | 2006 |
| 0.0 – 0.0 | 561 | 2441 | 2.88 | 7.88 |
| 0.1 – 0.99 | 11609 | 11511 | 59.6 | 37.17 |
| 1.0 – 1.99 | 3653 | 7854 | 18.75 | 25.36 |
| 2.0 – 2.99 | 1931 | 5283 | 9.91 | 17.06 |
| 3.0 – 3.99 | 713 | 1930 | 3.66 | 6.23 |
| 4.0 & > 4.0 | 1012 | 1951 | 5.2 | 6.3 |
| Total Papers | 19479 | 30970 | 19479 | 30970 |

2. Publication Distribution by Sector

The universities & colleges sector contributed the largest publication share to the country output in S&T. In 2006, its publication share was 48.92%, followed by R&D sector (34.26%), institutes of national importance (22.59%), industry (2.32%) and the others (5.92%). In terms of shift in their share to country's output during 2001 to 2006, the institutes of national importance witnesses the maximum increase of 2.45% (rising from 20.14% to 22.59%), followed by 2.34% (from 46.58% to 48.92%) in case of universities & colleges sector and 1.03% (from 2.32% to 3.35%) in industry sector. The R&D sector, on the other hand, witnessed the decrease by 2.53% (decreasing from 20.14% to 22.59%). The industry sector showed the fastest growth (130.38%) in their publication output from 2001 to 2006, followed by institutes of national importance sector (78.36%), universities & colleges sector (66.95%) and R&D sector (48.05%) (Table 4).

Table 4. Distribution of Papers by Broad Sectors, 2001 & 2006

| Sector | Publication Output | | % Share of Output | | Growth Rate |
|----------------------------------|--------------------|-------|-------------------|--------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| Univ & Coll | 9074 | 15149 | 46.58 | 48.92 | 66.95 |
| R&D | 7166 | 10609 | 36.79 | 34.26 | 48.05 |
| Institute of National Importance | 3923 | 6997 | 20.14 | 22.59 | 78.36 |
| Industry | 451 | 1039 | 2.32 | 3.35 | 130.38 |
| Others | 1030 | 1832 | 5.29 | 5.92 | 77.86 |
| Total | 19479 | 30970 | 100.00 | 100.00 | 58.99 |

The largest impact (1.93) has been made by R&D sector during 2006, followed by institutes of national importance sector (1.70), industry sector (1.41) and universities & colleges sector (1.35). The R&D sector witnessed the maximum increase of 0.27% (from 1.57 to 1.93) in impact from 2001 to 2006, followed by 0.38% increase (from 0.97% to 1.35%) in universities & colleges sector, 0.28% increase (from 1.42% to 1.70%) in institutes of national importance sector and 0.24% increase (from 1.17% to 1.41%) in industry sector (Table 5)

Table 5. Distribution of Papers and Impact by Broad Sectors, 2001 & 2006

| Sector | Total Papers | | Average IF/Paper | | |
|----------------------------------|--------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Universities & Colleges | 9074 | 15149 | 0.97 | 1.35 | 0.38 |
| R&D | 7166 | 10609 | 1.57 | 1.93 | 0.36 |
| Institute of National Importance | 3923 | 6997 | 1.42 | 1.70 | 0.28 |
| Industry | 451 | 1039 | 1.17 | 1.41 | 0.24 |
| Others | 1030 | 1832 | 1.90 | 2.32 | 0.42 |
| Total | 19479 | 30970 | 1.27 | 1.63 | 0.36 |

In terms of DST classification, the universities & colleges sector contributed the largest publication share to the country output in S&T. In 2006, its publication share was 45.86%, followed by research institutes (34.26%), institutes of national importance (22.59%), deemed universities (4.33%) and the others (9.17%). In terms of shift in their share to country's output during 2001 to 2006, the institutes of national importance witnesses the maximum increase of 2.45% (rising from 20.14% to 22.59%), followed by 1.97% (from 2.56% to 4.33%) in deemed universities and 1.19% (from 44.67% to 45.86%) in universities & colleges sector.. The R&D sector, on the other hand, witnessed the decrease by 2.53% (decreasing from 20.14% to 22.59%). The deemed universities showed the fastest growth (169.28%) in their publication output from 2001 to 2006, followed by institutes of national importance sector (78.36%), universities & colleges sector (63.22%) and research institutes (48.05%)(Table 6).

Table 6. Distribution of Papers According by Institute Type (DST Classification)

| Sector | Publication Output | | % Share of Output | | Growth Rate |
|----------------------------------|--------------------|-------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| University/Colleges | 8701 | 14202 | 44.67 | 45.86 | 63.22 |
| Deemed Universities | 498 | 1341 | 2.56 | 4.33 | 169.28 |
| Research Institutes | 7170 | 10609 | 36.81 | 34.26 | 47.96 |
| Institute of National Importance | 3923 | 6997 | 20.14 | 22.59 | 78.36 |
| Others | 1467 | 2840 | 7.53 | 9.17 | 93.59 |
| Total | 19479 | 30970 | 100 | 100 | 58.99 |

Among the various institutions, the largest impact (1.93) had been made by research institutes during 2006, followed by institutes of national importance sector (1.70), universities & colleges (1.37) and deemed universities (1.09). The universities & colleges witnessed the maximum increase of 0.39% (from 0.98 to 1.37) in impact from 2001 to 2006, followed by 0.36% increase (from 1.57% to 1.93%) in research institutes, 0.29% increase (from 0.80% to 1.09%) in deemed universities and 0.28% increase (from 1.42% to 1.70%) in institutes of national importance (Table 7)

Table 7. Distribution of Papers and Impact by Broad Sectors, 2001 & 2006(DST Classification)

| Sector | Total Papers | | Average IF/Paper | | |
|----------------------------------|--------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| University/Colleges | 8701 | 14202 | 0.98 | 1.37 | 0.39 |
| Deemed Universities | 498 | 1341 | 0.80 | 1.09 | 0.29 |
| Research Institutes | 7170 | 10609 | 1.57 | 1.93 | 0.36 |
| Institute of National Importance | 3923 | 6997 | 1.42 | 1.70 | 0.28 |
| Others | 1467 | 2840 | 1.67 | 1.99 | 0.32 |
| Total | 19479 | 30970 | 1.27 | 1.63 | 0.36 |

2.1 Universities & Colleges Sector

Among the universities & colleges sector, the universities had made the largest contribution of 64.64% in 2006, followed by colleges (36.22%), deemed universities (8.85%) and inter-universities (2.26%). The contribution of universities had decreased from 67.56% to 59.74% from 2001 to 2006, while that of others increased: colleges (from 32.28% to 36.22%), deemed universities (from 5.49% to 8.85%) and inter-university centers (from 2.02% to 2.26%). In terms of growth from 2001 to 2006, deemed universities recorded the largest growth (169.28%), followed by inter-university centers (87.43%), colleges (87.33%) and universities (59.74%)(Table 8).

Table 8. Distribution of Papers by Universities & Colleges Sector

| Sector | Publication Output | | % Share of Output | | Growth Rate |
|-------------------|--------------------|-------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| University | 6130 | 9792 | 67.56 | 64.64 | 59.74 |
| Deemed University | 498 | 1341 | 5.49 | 8.85 | 169.28 |
| Interuniversity | 183 | 343 | 2.02 | 2.26 | 87.43 |
| Colleges | 2929 | 5487 | 32.28 | 36.22 | 87.33 |
| Total | 9074 | 15149 | 100 | 100 | 66.95 |

In terms of impact as measured by impact factor, the largest impact (2.02) was scored by inter-university centers during 2006, followed by universities (1.38), colleges (1.26) and deemed universities (1.09). The universities showed the maximum increase of 0.39% (from 0.99 to 1.38) in impact from 2001 to 2006, followed by 0.37% (from 0.89% to 1.26%) in colleges, 0.29% (from 0.80 to 1.09) in deemed universities and 0.15% (from 1.87% to 2.02%) in inter-university centers (Table 9).

Table 9. Universities & Colleges Sector: Distribution of Papers by Type of Institutions

| Institute Type | 2001 | | | 2006 | | |
|-------------------------|--------|----------|-------------------|--------|----------|-------------------|
| | Papers | Total IF | Average IF/ Paper | Papers | Total IF | Average IF/ Paper |
| University | 6130 | 6039.942 | 0.99 | 9792 | 13545.61 | 1.38 |
| Deemed University | 498 | 396.285 | 0.80 | 1341 | 1456.481 | 1.09 |
| Interuniversity centres | 183 | 342.832 | 1.87 | 343 | 694.277 | 2.02 |
| Colleges | 2929 | 2599.259 | 0.89 | 5487 | 6929.385 | 1.26 |
| Total | 9074 | 8801.545 | 0.97 | 15149 | 20419.63 | 1.35 |

2.2 R&D Sector

Among the R&D sector, the Council of Scientific & Industrial Research (CSIR) research institutions had made the largest contribution (33.92% share) in 2006, followed by Department of Atomic Energy (DAE)(20.94% share) research institutions, Department of Science & Technology (DST) (10.54% share) research institutions, Indian Council of Agricultural Research (ICAR)(9.99% share) research institutions, Defense Research & Development Organization (DRDO)(4.72% share) research institutions, Indian Council of Medical Research (ICMR)(3.55% share) research institutions, Ministry of Health & Family Welfare (MHFW)(3.42% share) research institutions, Department of Space (DOS)(3.33%) research institutions, etc. Among the major science departments/agencies, the contribution of CSIR has increased from 2001 to 2006 by 2.83% (from 31.08% to 33.92%), followed by MHFW by 0.59% (from 2.83% to 3.42%), DRDO by 0.56% (from 4.16% to 4.72%), DBT by 0.32% (from 1.87% to 2.19%), ICAR by 0.29% (from 9.70% to 9.99%), MOWR by 0.29% (from 0.47% to 0.76%), DOE by 0.24% (from 0.17% to 0.41%), MOC-DOC by 0.14% (from 0.11% to 0.25%) MOEN by 0.05% (from 0.87% to 0.92%), MOCF-DCP by 0.10% (from 0.10% to 0.20%), MOD by 0.09% (from 0.06% to 0.15%), MHRD by 0.06% (from 0.73% to 0.79%), etc. In contrast, the contribution of DAE has decreased from 2001 to 2006 by 3.38% (from 24.32% to 20.94%), DST by 1.59% (from 12.13% to 10.54%), DOS by 0.69% (from 4.02% to 3.33%), MOER by 0.48% (from 0.91% to 0.43%), MOM by 0.35% (0.88% to 0.53%), MOIT by 0.11% (from 0.74% to 0.63%), etc. (Table 10).

Table 10. Distribution of Papers under R&D Sector

| Sector | Publication Output | | % Share of Output | | Growth Rate from 2001 to 2006 |
|----------|--------------------|------|-------------------|-------|-------------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| CSIR | 2227 | 3599 | 31.08 | 33.92 | 61.61 |
| DAE | 1743 | 2222 | 24.32 | 20.94 | 27.48 |
| DST | 869 | 1118 | 12.13 | 10.54 | 28.65 |
| ICAR | 695 | 1060 | 9.70 | 9.99 | 52.52 |
| DRDO | 298 | 501 | 4.16 | 4.72 | 68.12 |
| ICMR | 250 | 377 | 3.49 | 3.55 | 50.80 |
| MHFW | 203 | 363 | 2.83 | 3.42 | 78.82 |
| DOS | 288 | 353 | 4.02 | 3.33 | 22.57 |
| DBT | 134 | 232 | 1.87 | 2.19 | 73.13 |
| MOEN | 55 | 87 | 0.77 | 0.82 | 58.18 |
| MHRD | 52 | 84 | 0.73 | 0.79 | 61.54 |
| MOWR | 34 | 81 | 0.47 | 0.76 | 138.24 |
| MOIT | 53 | 67 | 0.74 | 0.63 | 26.42 |
| MOM | 63 | 56 | 0.88 | 0.53 | -11.11 |
| MOER | 65 | 46 | 0.91 | 0.43 | -29.23 |
| DOE | 12 | 43 | 0.17 | 0.41 | 258.33 |
| MOC-DOC | 8 | 26 | 0.11 | 0.25 | 225.00 |
| MOCF-DCP | 7 | 21 | 0.10 | 0.20 | 200.00 |
| MOD | 4 | 16 | 0.06 | 0.15 | 300.00 |

| | | | | | |
|-------|------|-------|--------|--------|--------|
| MOP | 8 | 11 | 0.11 | 0.10 | 37.50 |
| MOTX | 14 | 8 | 0.20 | 0.08 | -42.86 |
| MOHA | 2 | 6 | 0.03 | 0.06 | 200.00 |
| MNCES | 1 | 2 | 0.01 | 0.02 | 100.00 |
| MPNG | 1 | 2 | 0.01 | 0.02 | 100.00 |
| Total | 7166 | 10609 | 100.00 | 100.00 | 48.05 |

In terms of impact as measured by impact factor, the largest impact (3.04) during 2006 was scored by DBT, followed by MHFW (2.84), DST (2.45), ICMR (2.42), DAE (2.13), CSIR (2.02), DOS (1.53), MOIT (1.45), DOE (1.40), MNCES (1.36), MOC-DOC (1.34), MOWR (1.22), DRDO (1.20), MOCF-DCP (1.18), MHRD (1.03), MOER (1.01), etc. Over the years, the largest increase in impact factor from 2001 to 2006 was scored by MOD by 3.60 (from 0.81 to 4.41), followed by MHFW (0.90), MOC-DOC (0.70), DOE (0.63), CSIR (0.61), ICMR (0.48), MOCF-DCP (0.47), MOWR (0.45), DRDO (0.44), ICAR (0.42), MOHA (0.30), DST (0.28), MOP (0.28), MOTX (0.24), DBT (0.22), DAE (0.09) and MNCES (0.05). In contrast, there was a decrease in impact from 2001 to 2006 in case of MPNG BY 0.43%, followed by MOEN (0.38), MOER (0.19), MHRD (0.09), MOIT (0.08) and MOM (0.04) (Table 11).

Table 11. R&D Sector: Distribution of Papers by Major Funding Agencies

| | Total Papers | | Average IF/Paper | | |
|-----------|--------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| CSIR | 2227 | 3599 | 1.41 | 2.02 | 0.61 |
| DAE | 1743 | 2222 | 2.04 | 2.13 | 0.09 |
| DST | 869 | 1118 | 2.17 | 2.45 | 0.28 |
| ICAR | 695 | 1060 | 0.48 | 0.90 | 0.42 |
| DRDO | 298 | 501 | 0.76 | 1.20 | 0.44 |
| ICMR | 250 | 377 | 1.94 | 2.42 | 0.48 |
| MHFW | 203 | 363 | 1.93 | 2.84 | 0.91 |
| DOS | 288 | 353 | 1.53 | 1.53 | 0.00 |
| DBT | 134 | 232 | 2.82 | 3.04 | 0.22 |
| MOEN | 55 | 87 | 1.23 | 0.85 | -0.38 |
| MHRD | 52 | 84 | 1.12 | 1.03 | -0.09 |
| MOWR | 34 | 81 | 0.77 | 1.22 | 0.45 |
| MOIT | 53 | 67 | 1.53 | 1.45 | -0.08 |
| MOM | 63 | 56 | 0.73 | 0.69 | -0.04 |
| MOER | 65 | 46 | 1.20 | 1.01 | -0.19 |
| DOE | 12 | 43 | 0.87 | 1.40 | 0.53 |
| MOC-DOC | 8 | 26 | 0.64 | 1.34 | 0.70 |
| MOCF-DCP | 7 | 21 | 0.71 | 1.18 | 0.47 |
| MOD | 4 | 16 | 0.81 | 4.41 | 3.60 |
| MOP | 8 | 11 | 0.65 | 0.93 | 0.28 |
| MOTX | 14 | 8 | 0.53 | 0.77 | 0.24 |
| MOHA | 2 | 6 | 0.50 | 0.80 | 0.30 |
| MNCES | 1 | 2 | 1.31 | 1.36 | 0.05 |
| MPNG | 1 | 2 | 1.17 | 0.74 | -0.43 |
| Total R&D | 7166 | 10609 | 1.57 | 1.93 | 0.36 |

CSIR=Council of Scientific & Industrial Research; DAE=Department of Atomic Energy; DBT=Department of Biotechnology; DOE=Department of Electronics; DOS=Department of Space; DRDO=Defense Research & Development Organization; DST=Department of Science & Technology; ICAR=Indian Council of Agricultural Research; ICMR=Indian Council of Medical Research; MHFW=Ministry of Health & Family Welfare; MHRD=Ministry of Human Resource Development; MNCES=Ministry of Non-Conventional Energy Resources; MOC-DOC=Ministry of Commerce-Department of Commerce; MOCF-DCP=Ministry of Chemicals & Fertilizers-Department of Chemicals & Petrochemicals; MOD=Ministry of Defense; MOEN= ministry of Environment & Forests'; MOER= Ministry of Earth Resources; MOHA=Ministry of Home Affairs; MOIT=Ministry of Information Technology & Communications; MOM: Ministry of Mines; MOP: Ministry of Mines; MOP: Ministry of Power; MOTX=Ministry of Textiles; MOWR: Ministry of Water Resources; MPNG: Ministry of Petroleum & Natural Gas; PU'; Public Funding (Hospitals); state: State funding

|

2.3 Industry Sector

Among the industrial sector, the private industries had made the largest contribution of 91.63% in 2006, followed by public sector industry (8.66%). The contribution of public sector industry had decreased from 26.83% to 8.66% from 2001 to 2006, while that of private industry increased from 73.17% TO 91.635 during the same period (Table 12).

Table 12. Industry Sector: Growth & Distribution of Papers by Type of Industry

| Industry | Publication Output | | % Share of Output | | Growth Rate |
|------------------|--------------------|------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| Public Industry | 121 | 90 | 26.83 | 8.662 | -25.62 |
| Private Industry | 330 | 952 | 73.17 | 91.63 | 188.48 |
| Total Industry | 451 | 1039 | 100 | 100 | 130.38 |

In terms of impact as measured by impact factor, the largest impact (1.48) was scored by private sector industry during 2006, followed by public sector industry (0.72). The contribution of private sector industries showed the increase from 1.23 to 1.48 in impact from 2001 to 2006, as against decrease from 1.04 to 0.72 by public sector industry during the same period (Table 13).

Table 13. Industry Sector: Distribution of Papers and Impact by Type of Industry

| Industry | Total Papers | | Average IF/Paper | | |
|------------------|--------------|------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Public Industry | 121 | 90 | 1.04 | 0.72 | -0.32 |
| Private Industry | 330 | 952 | 1.23 | 1.48 | 0.25 |
| Total Industry | 451 | 1039 | 1.17 | 1.41 | 0.24 |

2.4 Others

Among the others, the private hospitals had made the largest contribution of 55.40% in 2006, followed by research institutions (20.31%), individuals (10.75%), foundations (9.72%), others (1.86%) and trusts (1.09%). The contribution has increased from 2001 to 2006 in case of hospitals from 47.67% to 55.40%, associations, academic & societies from 2.52% to 4.20% and trusts from 2.52% to 4.20%, against decrease from 24.76% to 20.31% in research institutes, from 13.40% to 10.75% in individuals and 12.04% to 9.72% in foundations from 2001 to 2006 (Table 14).

Table 14. Others: Growth & Distribution of Papers by Type of Institutions

| Industry | Publication Output | | % Share of Output | | Growth Rate |
|-------------------------------------|--------------------|------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| Hospitals | 491 | 1015 | 47.67 | 55.4 | 45.88 |
| Research Institutions | 255 | 372 | 24.76 | 20.31 | 42.75 |
| Individuals | 138 | 197 | 13.40 | 10.75 | 43.55 |
| Foundations | 124 | 178 | 12.04 | 9.72 | 196.15 |
| Associations, academies & societies | 26 | 77 | 2.52 | 4.20 | 196.15 |
| Trusts | 5 | 20 | 0.48 | 1.09 | 300.00 |
| Others | 13 | 34 | 1.26 | 1.86 | 161.54 |
| Total | 1030 | 1832 | 100 | 100 | 77.86 |

In terms of impact as measured by impact factor, the largest impact (7.59) was scored by others during 2006, followed by trusts (3.82), foundations (2.31), hospitals (2.37), research institutions (2.25), associations, academies & societies (2.10), and individuals (1.10). The impact showed increase from 2001 to 2006 by 4.91 in others, followed by foundations (1.0), trusts (0.94), research institutions (0.51) and hospitals (0.28), as against decrease by 0.64% in associations, academies and societies during the same period (Table 15).

Table 15. Industry Sector: Distribution of Papers and Impact by Type of Institutions

| Industry | Total Papers | | Average IF/Paper | | |
|-------------------------------------|--------------|------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Hospitals | 491 | 1015 | 2.09 | 2.37 | 0.28 |
| Research Institutions | 255 | 372 | 1.74 | 2.25 | 0.51 |
| Individuals | 138 | 197 | 1.52 | 1.10 | -0.42 |
| Foundations | 124 | 178 | 1.71 | 2.71 | 1.00 |
| Associations, academies & societies | 26 | 77 | 2.74 | 2.10 | -0.64 |
| Trusts | 5 | 20 | 2.88 | 3.82 | 0.94 |
| Others | 13 | 34 | 2.68 | 7.59 | 4.91 |
| Total | 1030 | 1832 | 1.90 | 2.32 | 0.42 |

3. Subject-Wise Analysis

The country total research output during 2001 and 2006 has been classified under 12 broad subjects including multidisciplinary sciences, using *Web of Science* classification.

Of these 12 broad subjects, chemistry, engineering sciences and physics & astronomy are considered as the major productive subject areas of Indian S&T. The combined research output of these three subjects have increased from 12077 papers in 2001 to 19547 papers in 2006 and also their combined publications share in the country output have increased from 62.0% in 2001 to 63.12% in 2006. Their individual publication share ranges from 18.85% to 23.08% (Table 16)

In terms of activity index, there is growth in research activity in engineering sciences (from 95.54 to 120.80) and chemistry (from 99.73 to 100.17), as against decrease in research activity in physics & astronomy (from 101.56 to 99.02) from 2001 to 2006% (Table 17)

The maximum growth (71.08%) of publications output has been recorded by engineering sciences, followed by chemistry (59.70%) and physics & astronomy (55.02%). Only physics & astronomy has recorded growth less than the national publication growth (58.99%) from 2001 to 2006 (Table 16)

Among the major productive subject areas, the largest impact (1.80) was made by physics & astronomy during 2006, followed by chemistry (1.70) and engineering (1.15). There was an increase in impact from 2001 to 2006 by 0.53 (from 1.17 to 1.70) in chemistry, followed by 0.43 (from 0.72 to 1.15) in engineering and 0.02 (from 1.78 to 1.80) in physics & astronomy (Table 18).

Clinical medicine, basic life sciences, biomedical sciences and agricultural & food sciences are the four medium productive subject areas of Indian S&T. The combined research output of these four subjects have increased from 7529 papers in 2001 to 12905 papers in 2006 and also their combined publications share in the country output have increased from 38.65% in 2001 to 41.67% in 2006. Their individual publication share ranges from 7.75% to 12.90%(Table 16)

In terms of activity index, there is growth in research activity in clinical medicine (from 83.22 to 110.55), biomedical sciences (from 88.27 to 107.37) and basic life sciences (from 95.70 to 102.70), as against decrease in research activity in agricultural & food sciences (from 119.06 to 81.01) from 2001 to 2006 (Table 17)

The maximum growth (111.20%) of publications output has been recorded by clinical medicine, followed by biomedical sciences (93.40%), basic life sciences (70.61%) and agricultural & food sciences (17.52%). Only agricultural & biological sciences has recorded growth less than the national publication growth (58.99%) from 2001 to 2006 (Table 16)

Among the medium productive subject areas, the largest impact (2.39) was made by clinical medicine during 2006, followed by basic life sciences (2.35), biomedical sciences (2.20) and agricultural & food sciences (0.84). There was an increase in impact from 2001 to 2006 by 0.67 (from 1.53 to 2.20) in biomedical sciences, followed by 0.48 (from 1.91 to 2.39) in clinical medicine, 0.40 (from 0.44 to 0.84) in agricultural & food sciences and 0.26% (from 2.09 to 2.35) in basic life sciences (Table 18).

Earth & environmental sciences, computer sciences, biological sciences and mathematics & statistics are the four low productive subject areas of Indian S&T. The combined research output of these four subjects have increased from 3054 papers in 2001 to 5341 papers in 2006 and also their combined publications share in the country output have increased from 15.68% in 2001 to 17.25% in 2006. Their individual publication share ranges from 2.25% to 6.45% (Table 16)

In terms of activity index, there is growth in research activity in computer science (from 59.69 to 125.35) and earth & environmental sciences (from 99.18 to 100.52), as against decrease in research activity in mathematics & statistics (from 114.95 to 90.59) and biological sciences (from 106.47 to 95.47) from 2001 to 2006 (Table 17)

The maximum growth (233.90%) of publications output has been recorded by computer science, followed earth & environmental sciences (61.13%), biological sciences (43.24%) and mathematics & statistics (25.31%). Only biological sciences and mathematics & statistics have recorded growth less than the national publication growth (58.99%) from 2001 to 2006 (Table 16)

Among the low productive subject areas, the largest impact (1.47) was made by biological sciences during 2006, followed by earth & environmental sciences (1.27), mathematics & statistics (0.67) and computer science (0.44). There was an increase in impact from 2001 to 2006 by 0.38 (from 1.09 to 1.47), followed by 0.38 (from 0.89 to 1.27) in earth & environmental sciences and 0.30% (from 0.47 to 0.67) in mathematics & statistics, against decrease by 0.11 (from 0.55 to 0.44) in computer science during the same period (Table 18).

Table 16 Distribution of Papers and Impact by Broad Main Subjects, 2001 & 2006

| Main Subjects | Publication Output | | % Share in National Output | | Growth from 2001 to 2006 |
|--------------------------|--------------------|-------|----------------------------|-------|--------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| Chemistry | 4476 | 7148 | 22.98 | 23.08 | 59.70 |
| Engineering Sciences | 3835 | 6561 | 19.69 | 21.18 | 71.08 |
| Physics & Astronomy | 3766 | 5838 | 19.33 | 18.85 | 55.02 |
| Clinical Medicine | 1892 | 3996 | 9.71 | 12.90 | 111.2 |
| Basic Life Sciences | 1943 | 3315 | 9.97 | 10.70 | 70.61 |
| Biomedical Sciences | 1651 | 3193 | 8.47 | 10.31 | 93.40 |
| Agricultural & Food Sci. | 2043 | 2401 | 10.49 | 7.75 | 17.52 |
| Earth & Envir. Sci. | 1240 | 1998 | 6.37 | 6.45 | 61.13 |
| Computer Science | 443 | 1479 | 2.27 | 4.77 | 233.9 |
| Biological Sciences | 814 | 1166 | 4.18 | 3.76 | 43.24 |
| Multi-disciplinary | 897 | 907 | 4.60 | 2.93 | 1.115 |
| Mathematics & Statistics | 557 | 698 | 2.86 | 2.25 | 25.31 |
| Total | 19479 | 30970 | 100 | 100 | 58.99 |

Table 17. Distribution of Papers by Number and Activity Index, 2001 & 2006

| Main Subjects | Number of Papers | | Activity Index | |
|--------------------------|------------------|-------|----------------|--------|
| | 2001 | 2006 | 2001 | 2006 |
| Agricultural & Food Sci. | 2043 | 2401 | 119.06 | 88.01 |
| Basic Life Sciences | 1943 | 3315 | 95.70 | 102.70 |
| Biological Sciences | 814 | 1166 | 106.47 | 95.93 |
| Biomedical Sciences | 1651 | 3193 | 88.27 | 107.37 |
| Chemistry | 4476 | 7148 | 99.73 | 100.17 |
| Clinical Medicine | 1892 | 3996 | 83.22 | 110.55 |
| Computer Science | 443 | 1479 | 59.69 | 125.35 |
| Earth & Envir. Sci. | 1240 | 1998 | 99.18 | 100.52 |
| Engineering Sciences | 3835 | 6561 | 95.54 | 102.80 |
| Mathematics & Statistics | 557 | 698 | 114.95 | 90.59 |
| Multi-disciplinary | 897 | 907 | 128.78 | 81.89 |
| Physics & Astronomy | 3766 | 5838 | 101.56 | 99.02 |
| Total | 19479 | 30970 | 100 | 100 |

Table 18. Distribution of Papers by Number & Impact, 2001 & 2006

| | No. of Papers | | Average IF/Paper | | |
|--------------------------|---------------|------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Agricultural & Food Sci. | 2043 | 2401 | 0.44 | 0.84 | 0.40 |
| Basic Life Sciences | 1943 | 3315 | 2.09 | 2.35 | 0.26 |
| Biological Sciences | 814 | 1166 | 1.09 | 1.47 | 0.38 |
| Biomedical Sciences | 1651 | 3193 | 1.53 | 2.20 | 0.67 |
| Chemistry | 4476 | 7148 | 1.17 | 1.70 | 0.53 |
| Clinical Medicine | 1892 | 3996 | 1.91 | 2.39 | 0.48 |
| Computer Science | 443 | 1479 | 0.55 | 0.44 | -0.11 |
| Earth & Envir. Sci. | 1240 | 1998 | 0.89 | 1.27 | 0.38 |
| Engineering Sciences | 3835 | 6561 | 0.72 | 1.15 | 0.43 |
| Mathematics & Statistics | 557 | 698 | 0.47 | 0.67 | 0.20 |

| | | | | | |
|---------------------|-------|-------|------|------|------|
| Multi-disciplinary | 897 | 907 | 1.19 | 1.37 | 0.18 |
| Physics & Astronomy | 3766 | 5838 | 1.78 | 1.80 | 0.02 |
| Total | 19479 | 30970 | 1.27 | 1.63 | 0.36 |

According to DST classification, the maximum share of papers (25.61%) is accounted by engineering & technology during 2006, followed by chemical sciences (23.07%), medical sciences (21.53%), physical sciences (18.83%), biological sciences (13.79%), agricultural sciences (7.75%), earth & environmental sciences (6.45) and mathematics (2.35%). The share in national output had increased from 2001 to 2006 from 21.93% to 25.61% in engineering & technology, from 22.95% to 23.07% in chemical sciences, from 16.74% to 21.53% in medical sciences, from 13.17% to 13.79% in biological sciences and from 6.36% to 6.45% in earth & environmental sciences, as against decrease from 19.28% to 18.83% in physical sciences, from 10.49% to 7.75% in agricultural sciences and from 2.85% to 2.25% in mathematics & statistics. The same trend is also observed in activity index (Table 19 and Table 20).

Table 19. Distribution of Papers by Broad Main Subjects, 2001 & 2006 (DST Classification)

| Main Subjects | Number of Papers | | % Share of Papers | |
|--------------------------------|------------------|-------|-------------------|-------|
| | 20001 | 2006 | 20001 | 2006 |
| Engineering & Technology | 4271 | 7932 | 21.93 | 25.61 |
| Chemical Sciences | 4471 | 7146 | 22.95 | 23.07 |
| Medical Sciences | 3260 | 6668 | 16.74 | 21.53 |
| Physical Sciences (Physics) | 3755 | 5832 | 19.28 | 18.83 |
| Biological Sciences | 2565 | 4272 | 13.17 | 13.79 |
| Agricultural Sciences | 2043 | 2401 | 10.49 | 7.75 |
| Earth & Environmental Sciences | 1239 | 1998 | 6.36 | 6.45 |
| Mathematics | 556 | 698 | 2.85 | 2.25 |
| Total | 19479 | 30970 | 100 | 100 |

Table 19A. Distribution of Papers by Number and Activity Index, 2001 & 2006 (DST Classification)

| Main Subjects | Number of Papers | | Activity Index | |
|--------------------------------|------------------|-------|----------------|--------|
| | 20001 | 2006 | 20001 | 2006 |
| Engineering & Technology | 4271 | 7932 | 90.65 | 105.88 |
| Chemical Sciences | 4471 | 7146 | 99.68 | 100.20 |
| Medical Sciences | 3260 | 6668 | 85.04 | 109.41 |
| Physical Sciences (Physics) | 3755 | 5832 | 101.44 | 99.09 |
| Biological Sciences | 2565 | 4272 | 97.16 | 101.78 |
| Agricultural Sciences | 2043 | 2401 | 119.06 | 88.01 |
| Earth & Environmental Sciences | 1239 | 1998 | 99.13 | 100.54 |
| Mathematics | 556 | 698 | 114.83 | 90.67 |
| | 19479 | 30970 | 100 | 100 |

Among the various productive subject areas, the largest impact (2.34) was made by earth & environmental sciences during 2006, followed by chemical sciences (2.10), mathematics (1.80), medical sciences (1.70), physical sciences (1.27), biological sciences (1.03), engineering & technology (0.84) and agricultural sciences (0.67). There was an increase in impact from 2001 to 2006 in all the broad subject areas from 2001 to 2006 (Table 20).

Table 20. Distribution of Papers by Number & Impact, 2001 & 2006 (DST Classification)

| Main Subjects | Number of Papers | | Average IF/Paper | |
|--------------------------------|------------------|-------|------------------|------|
| | 20001 | 2006 | 20001 | 2006 |
| Earth & Environmental Sciences | 1239 | 1998 | 1.79 | 2.34 |
| Chemical Sciences | 4471 | 7146 | 1.79 | 2.10 |
| Mathematics | 556 | 698 | 1.79 | 1.80 |
| Medical Sciences | 3260 | 6668 | 1.17 | 1.70 |
| Physical Sciences (Physics) | 3755 | 5832 | 0.89 | 1.27 |
| Biological Sciences | 2565 | 4272 | 0.71 | 1.03 |
| Engineering & Technology | 4271 | 7932 | 0.44 | 0.84 |
| Agricultural Sciences | 2043 | 2401 | 0.47 | 0.67 |
| Total | 19479 | 30970 | 1.27 | 1.63 |

4. Institutional Profile

Based on publications output data for India in science and technology, a total of 15 institutions were identified as high productive ones publishing more than 300 papers in the country output during 2006

Category wise these include: (i) Seven institutes of national importance (Indian Institute of Science (IISc-BANG), Indian Institute of Technology, Kharagpur (IIT-KHAR, All India Institute of Medical Science (AIIMS-DELH), Indian Institute of Technology, Delhi (IIT-DELH), Indian Institute of Technology, Chennai (IIT-Chen), Indian Institute of Technology, Kanpur (IIT-Kanp) and Indian Institute of Technology, Mumbai (IIT-Mumb); (ii) Four research institutes (Bhabha Atomic Research Institute, Mumbai (BARC-MUMB), Indian Institute of Chemical Technology, Hyderabad (IICT-HYDE), Tata Institute of Fundamental Research, Mumbai (TIFR-MUMB) and National Chemical Laboratory, Pune (NCL-PUNE) AND (iii) Four universities (Jadavpur University, Kolkata (JADAUNIV), university of Delhi (DELHUNIV), Banaras Hindu University, Varanasi (BHUVARA) and Madras University, Chennai (MADRUNIV).

The contribution of these top 15 institutions together has increased from 5868 papers in 2001 to 9278 papers in 2006, but their publication share in the country output has decreased from 30.12% to 29.93% during the same period. These institutions individually published between 300 and 1243 papers in 2006, with an average output of 618 papers per institution. Of these, 8 institutions each contributed publications output above the 150-institutions average (618 papers per institution).

These institutions along with their publications output are: Indian Institute of Science, Bangalore with 1243 papers during 2006, followed by Indian Institute of Technology, Kharagpur (916 papers), Bhabha Atomic Research Center, Mumbai (766 papers), All India Institute of Medical Sciences, Delhi (728 papers), Indian Institute of Technology, Delhi (721 papers), Indian Institute of Technology, Chennai (686 papers), Indian Institute of Technology, Kanpur (658 papers) and Indian Institute of Technology, Mumbai (650 papers) (Table 21).

Table 21. Publication Profile of Top 15 Most Productive Indian Organizations

| S.No. | Affiliation | Total Papers | | | Average IF per Paper | | |
|-------|---|--------------|-------|---------------------|----------------------|------|------------------|
| | | 2001 | 2006 | Growth 2001 to 2006 | 2001 | 2006 | Diff 2001 – 2006 |
| 1 | All India Institute of Medical Sciences, Delhi | 442 | 728 | 64.71 | 1.74 | 2.66 | 0.91 |
| 2 | National Chemical Laboratory, Pune | 341 | 436 | 27.86 | 1.91 | 2.27 | 0.36 |
| 3 | Tata Institute Of Fundamental Research, Mumbai | 431 | 388 | -9.977 | 2.74 | 2.23 | -0.51 |
| 4 | Indian Institute of Chemical Technology, Hyderabad | 287 | 545 | 89.9 | 1.78 | 2.1 | 0.32 |
| 5 | Indian Institute of Science, Bangalore | 928 | 1243 | 33.94 | 2.04 | 2.0 | -0.04 |
| 6 | University of Delhi, Delhi | 318 | 417 | 31.13 | 1.34 | 1.91 | 0.57 |
| 7 | Bhabha Atomic Research Center, Mumbai | 557 | 766 | 37.52 | 1.34 | 1.76 | 0.42 |
| 8 | Indian Institute of Technology, Kanpur | 363 | 658 | 81.27 | 1.28 | 1.69 | 0.4 |
| 9 | Banaras Hindu University, Varanasi | 234 | 310 | 32.48 | 1.05 | 1.65 | 0.6 |
| 10 | University of Madras, Chennai | 157 | 300 | 91.08 | 1.17 | 1.59 | 0.42 |
| 11 | Indian Institute of Technology, Mumbai | 385 | 650 | 68.83 | 1.18 | 1.56 | 0.39 |
| 12 | Indian Institute of Technology, Kharagpur | 439 | 916 | 108.7 | 0.88 | 1.37 | 0.49 |
| 13 | Jadavpur University, Kolkata | 276 | 504 | 82.61 | 1.3 | 1.37 | 0.07 |
| 14 | Indian Institute of Technology, Chennai | 334 | 686 | 105.4 | 0.98 | 1.27 | 0.29 |
| 15 | Indian Institute of Technology, Delhi | 376 | 721 | 91.76 | 0.91 | 1.26 | 0.35 |
| | Total Papers | 5868 | 9268 | 57.94 | 1.52 | 1.77 | 0.25 |
| | Total Indian Output | 19479 | 30970 | 58.99 | 1.27 | 1.63 | 0.36 |
| | Share of 15 top institutes in total national output | 30.12 | 29.93 | | | | |

The average growth rate of the top 15 Indian institutions from 2001 to 2006 was 57.94%. Nine Indian institutions achieved higher growth rate than the average growth rate of the top 15 Indian institutions, from 2001 to 2006. These are: Indian Institute of Technology, Kharagpur with growth rate of 108.7%, followed by Indian Institute of Technology, Chennai (105.4%), Indian Institute of Technology, Delhi (91.76%), University of Madras, Chennai (91.08%), Indian Institute of Chemical Technology, Hyderabad (89.90%), Jadavpur University, Kolkata (82.61%), Indian Institute of Technology, Kanpur (81.27%), Indian Institute of Technology, Mumbai (68.83%) and All India Institute of Medical Sciences, Delhi (64.71%)(Table 21).

The average impact factor per paper of these 15 institutions has increased from 1.52 during 2001 to 1.77 during 2006. Six institutions have recorded average impact above the average impact factor (1.77) of 15 top institutions during 2006. These are All India Institute of Medical Sciences, New Delhi with impact factor per paper as 2.66 during 2006, followed by National Chemical Laboratory, Pune (2.27), Tata Institute of Fundamental Research, Mumbai (2.23), Indian Institute of Chemical Technology, Hyderabad (2.1), Indian Institute of Science, Bangalore (2.0) and University of Delhi (1.91) (Table 21).

Except Indian Institute of Science, Bangalore and Tata Institute of Fundamental Research, Mumbai, all other 13 Indian institutions have improved the average impact factor from 2001 to 2006. The largest increase (0.90) in average impact factor was recorded by All Institute of Medical Sciences, followed by Banaras Hindu University, Varanasi (0.60), University of Delhi (0.57), Indian Institute of Technology, Kharagpur (0.49), University of Madras (0.42), Bhabha Atomic Research Centre, Mumbai (0.42), Indian Institute of Technology, Kanpur (0.40), Indian Institute of Technology, Mumbai (0.39), National Chemical Laboratory, Pune (0.36), Indian Institute of Technology (0.35), Indian Institute of Chemical Technology, Hyderabad (0.32), Indian Institute of Technology, Chennai (0.29) and Jadavpur University, Kolkata (0.07)(Table 21).

5. India's Research Output by Geographical Regions

High Productivity States: Maharashtra, Tamil Nadu, Delhi, West Bengal Karnataka, Uttar Pradesh and Andhra Pradesh are the top 7 high productivity states in terms of publications output and share and their combined national publication share in India's total publication output has increased from 72.23% in 2001 to 75.01% in 2006. Individually, their publication's share ranged from 8.0% to 16.0% in India's total cumulative publication output. The combined publication share of these seven high productive states have increased from 72.23% in 2001 to 75.01% in 2006. Among these seven most productive states, The national publication share of Tamil Nadu has shown the largest increase of 2.37% (from 11.11% to 13.48%) from 2001 to 2006, followed by 0.79% (from 10.10% to

10.89%) in Uttar Pradesh, 0.75% (from 11.06% to 11.81%) in West Bengal, 0.35% (from 12.14% to 12.48%), 0.19%) in Delhi and 0.19% (from 8.17% to 8.36%) in Andhra Pradesh. In contrast, the national publication share has decreased by 1.41% (from 15.98% to 14.57%) in Maharashtra and by 0.06% (from 11.83% to 11.77%) in Karnataka(Table 22).

Medium Productivity States: Kerala, Gujarat, Madhya Pradesh, Chandigarh, Uttarakhand, Punjab Rajasthan, Haryana, Assam and Jharkhand are the nine medium productivity states and their combined national publication share in India's total publication output has increased from 24.37% in 2001 to 25.55% in 2006. Their individual publication's share ranged from 0.90% to 3.78% in India's total publications output. Except for Rajasthan, Orissa and Gujarat, the national publication share of all other medium productive states have increased from 2001 to 2006(Table 22).

Low Productivity States: Himachal Pradesh, Jammu & Kashmir, Goa, Pondicherry, Meghalaya, Chattisgarh and Bihar are the seven low productivity states and their combined national publication share in India's total publication output has increased from 3.75% in 2001 and 3.82% in 2006. Their individual publication's share ranged from 0.29% to 0.81% in India's total research output. Except for Chhatisgarh and Bihar, all other five low productive states have increased their national publication share from 2001 to 2006(Table 22).

Least Productive States: Manipur, Nagaland, Tripura., Andaman & Nicobar, Sikkam, Mizoram, Arunachal Pradesh and Lakshdeep are the eight least productive states and their combined national publication share in India's total publication output have increased from 0.35% in 2001 to 0.42% in 2006 (Table 22).

Table 22. Distribution of India's Research Output by Geographical Regions, 2001 & 2006

| Main Subjects | Number of Papers | | % Share of Papers | |
|----------------|------------------|------|-------------------|-------|
| | 20001 | 2006 | 20001 | 2006 |
| Maharashtra | 3113 | 4512 | 15.98 | 14.57 |
| Tamil Nadu | 2165 | 4176 | 11.11 | 13.48 |
| Delhi | 2365 | 3868 | 12.14 | 12.49 |
| West Bengal | 2154 | 3658 | 11.06 | 11.81 |
| Karnataka | 2305 | 3645 | 11.83 | 11.77 |
| Uttar Pradesh | 1968 | 3373 | 10.1 | 10.89 |
| Andhra Pradesh | 1592 | 2590 | 8.17 | 8.36 |
| Kerala | 661 | 1171 | 3.39 | 3.78 |
| Gujarat | 620 | 975 | 3.18 | 3.15 |
| Madhya Pradesh | 513 | 901 | 2.63 | 2.91 |
| Chandigarh | 521 | 851 | 2.67 | 2.75 |
| Uttaranchal | 443 | 802 | 2.27 | 2.59 |
| Punjab | 348 | 732 | 1.79 | 2.36 |
| Rajasthan | 490 | 668 | 2.52 | 2.16 |
| Haryana | 345 | 551 | 1.77 | 1.78 |
| Assam | 240 | 475 | 1.23 | 1.53 |

| | | | | |
|-------------------|-------|-------|------|------|
| Orissa | 391 | 463 | 2.01 | 1.49 |
| Jharkhand | 176 | 323 | 0.90 | 1.04 |
| Himachal Pradesh | 135 | 251 | 0.69 | 0.81 |
| J&K | 87 | 233 | 0.45 | 0.75 |
| Goa | 97 | 215 | 0.50 | 0.69 |
| Pondicherry | 120 | 194 | 0.62 | 0.63 |
| Meghalaya | 67 | 110 | 0.34 | 0.35 |
| Chhattisgarh | 102 | 91 | 0.52 | 0.29 |
| Bihar | 123 | 89 | 0.63 | 0.29 |
| Manipur | 21 | 29 | 0.11 | 0.09 |
| Nagaland | 10 | 27 | 0.05 | 0.09 |
| Tripura | 14 | 27 | 0.07 | 0.09 |
| Andaman & Nicobar | 16 | 18 | 0.08 | 0.06 |
| Sikkim | 6 | 13 | 0.03 | 0.04 |
| Mizoram | 1 | 11 | 0.01 | 0.04 |
| Arunachal Pradesh | 0 | 4 | 0 | 0.01 |
| Lakshadweep | 0 | 1 | 0 | 0.00 |
| Total | 19479 | 30970 | 100 | 100 |

6. International Collaboration

India is having international collaboration with a number of developed and developing countries for research pursuits in science and technology. Based on publications output data for India in science and technology, it is found that its average annual share of international collaborative papers to its total cumulative publication output of India has increased from was 16.72% in 2001 to 19.05% in 2006. The average impact factor per paper of the India's international collaborative papers has increased from 2.06 during 2001 to 2.23 during 2006 (Table 23).

Table 23. Share and Impact of Indian Papers and Indian International Collaborative Papers

| Year | Total Indian Papers | Total International Collaborative Papers | Share of International Collaborative Papers In Indian research output | Total IF of Indian papers | Total IF of Indian international collaborative papers | Average IF/Papers of total Indian papers | Average IF/Papers of total Indian international collaborative papers |
|------|---------------------|--|---|---------------------------|---|--|--|
| 2001 | 19479 | 3256 | 16.72 | 24756.1 | 6704.486 | 1.27 | 2.06 |
| 2006 | 30970 | 5899 | 19.05 | 50613.04 | 13143.289 | 1.63 | 2.23 |

During 2006, the largest share (44.14%) of international collaborative papers with India has come from Europe, followed by North America (38.60%), Asia (30.99%), Oceania (4/56%), South America (3.46) and Africa (2.81%). The largest increase (7.49%) in international collaborative papers share with India has come from Asia (increasing from 23.50% to 30.99%) from 2001 to 2006, followed by 0.62% in Oceania (from 3.96% to 4.56%), and by 0.20% (from 3.26 to 3.46) in South America. In contrast, the international collaborative publication share has decreased by 4.98%

(from 43.58% to 38.60%) in North America from 2001 to 2006, followed 3.40% (from 47.54% to 44.14%) in Europe and by 0.35% (from 3.16% to 2.81%) in Africa. In terms of impact factor per paper, the largest impact (3.55) of the India's international collaborative papers during 2006 have been made by international collaborative papers with South America, followed by Africa (3.20), Oceania (2.72), North America (2.70), Europe (2.50) and Asia (2.26). The largest increase (1.49) in impact from 2001 to 2006 had been made by papers from Africa increasing from 1.71 to 3.20, followed by 0.82 (from 2.88 to 3.55) from papers with Oceania, 0.67 (from 2.88 to 3.55) from papers with South America, 0.34 (from 1.92 to 2.26) from papers with Asia, 0.31 (from 2.39 to 2.70) from papers with North America and 0.28 (from 2.22 to 2.50) from papers with Europe (Table 24 and Table 25).

Table 24. Distribution of Indian International Collaborative Papers by Broad Geographical Continent

| S.No. | Continents | ICP | | % ICP | |
|-------|--|------|------|-------|-------|
| | | 2001 | 2006 | 2001 | 2006 |
| 1 | Africa | 103 | 166 | 3.16 | 2.81 |
| 2 | Asia | 765 | 1828 | 23.50 | 30.99 |
| 3 | Europe | 1548 | 2604 | 47.54 | 44.14 |
| 4 | North America | 1419 | 2277 | 43.58 | 38.60 |
| 5 | Oceania | 129 | 269 | 3.962 | 4.56 |
| 6 | South America | 106 | 204 | 3.256 | 3.46 |
| | Total International Collaborative Papers | 3256 | 5899 | 100 | 100 |

ICP=International Collaborative Papers

Table 25. Distribution of Indian International Collaborative Papers by Broad Geographical Continent

| Continent | 2001 | | | 2006 | | |
|--|--------------|----------|-------------------|--------------|-----------|-------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| Africa | 103 | 176.34 | 1.71 | 166 | 530.396 | 3.20 |
| Asia | 765 | 1469.631 | 1.92 | 1828 | 4130.443 | 2.26 |
| Europe | 1548 | 3441.169 | 2.22 | 2604 | 6509.491 | 2.50 |
| North America | 1419 | 3396.996 | 2.39 | 2277 | 6143.279 | 2.70 |
| Oceania | 129 | 244.281 | 1.89 | 269 | 732.896 | 2.72 |
| South America | 106 | 305.232 | 2.88 | 204 | 724.132 | 3.55 |
| Total International Collaborative Papers | 3256 | 6704.486 | 2.06 | 5899 | 13143.289 | 2.33 |

Among the top 25 countries collaborating with India, the leading ones are: United States with 33.68% share in the total international collaborative publications during 2006, followed by Germany (12.63% share), United Kingdom (11.22% share), Japan (10.70% share), France (8.09% share),

South Korea (5.71% share), Canada (5.19% share), China (4.69% share), Italy (4.17% share), Australia (4.15% share), Switzerland (2.95% share), Taiwan (2.75% share), Spain (2.49% share), Russia (2.47% share), Malaysia (2.34% share), Brazil (2.03% share), Netherlands (2.00% share), Sweden (1.75% share), Belgium (1.42% share), Israel (1.32% share), Denmark (1.22% share), Poland (1.15% share), Mexico (0.91% share) and Thailand (0.89% share). The largest increase (3.97%) in international collaborative publication share with India from 2001 to 2006 has been accounted by South Korea rising from 1.84% to 5.71%, followed by 1.16% (from 3.53% to 4.69%), Malaysia by 1.14% (from 1.19% to 2.34%), by 0.74% (from 1.26% to 2.00%) in Singapore, by 0.69% (from 10.01% to 10.70%) in Japan, by 0.56% (from 3.59% to 4.15%) in Australia, by 0.44% (from 2.30% to 2.75%) in Taiwan, by 0.42% (from 2.06% to 2.47%) in Russia, by 0.34% (from 2.61% to 2.95%) in Switzerland, 0.28% (from 1.04% to 1.22%) in Israel, 0.18% (from 0.74% to 0.91%) in Argentina, 0.15% (from 0.15% (from 1.07% to 1.32%) in Denmark and 0.06% (from 2.43% to 2.49%) in Spain. In contrast, the largest decrease (4.34%) in international collaborative publication share with India from 2001 to 2006 was witnessed by United States (from 38.02% to 33.68%), followed by 2.85% (from 15.48% to 12.63%), 1.29% (from 3.29% to 2.0%) in Netherlands, 0.99% (from 5.16% to 4.17%) in Italy, 0.81% (from 8.91% to 8.09%) in France, 0.59 (from 5.77% to 5.19%) in Canada, 0.47% (from 1.38% to 0.91%) in Mexico, 0.26% (from 1.41% to 1.15%) in Poland, 0.08% (from 11.3% to 11.02%) in United Kingdom and 0.03% (from 0.92% to 0.89%) in Thailand (Table 26).

Table 26. Distribution of India's International Collaborative Papers by Major Countries

| S.No. | Collaborating Country | TICP | | % Share of TICP | | |
|-------|-----------------------|------|------|-----------------|-------|------------|
| | | 2001 | 2001 | 2001 | 2006 | Difference |
| 1 | USA | 1238 | 1987 | 38.02 | 33.68 | -4.34 |
| 2 | Germany | 504 | 745 | 15.48 | 12.63 | -2.85 |
| 3 | UK | 368 | 662 | 11.3 | 11.22 | -0.08 |
| 4 | Japan | 326 | 631 | 10.01 | 10.70 | 0.69 |
| 5 | France | 290 | 477 | 8.907 | 8.09 | -0.82 |
| 6 | South Korea | 60 | 337 | 1.843 | 5.71 | 3.87 |
| 7 | Canada | 188 | 306 | 5.774 | 5.19 | -0.59 |
| 8 | China | 115 | 277 | 3.532 | 4.69 | 1.16 |
| 9 | Italy | 168 | 246 | 5.16 | 4.17 | -0.99 |
| 10 | Australia | 117 | 245 | 3.593 | 4.15 | 0.56 |
| 11 | Switzerland | 85 | 174 | 2.611 | 2.95 | 0.34 |
| 12 | Taiwan | 75 | 162 | 2.303 | 2.75 | 0.44 |
| 13 | Spain | 79 | 147 | 2.426 | 2.49 | 0.07 |
| 14 | Russia | 67 | 146 | 2.058 | 2.47 | 0.42 |
| 15 | Malaysia | 39 | 138 | 1.198 | 2.34 | 1.14 |
| 16 | Brazil | 65 | 120 | 1.996 | 2.03 | 0.04 |
| 17 | Netherlands | 107 | 118 | 3.286 | 2.00 | -1.29 |
| 18 | Singapore | 41 | 118 | 1.259 | 2.00 | 0.74 |
| 19 | Sweden | 63 | 103 | 1.935 | 1.75 | -0.19 |
| 20 | Belgium | 44 | 84 | 1.351 | 1.42 | 0.07 |
| 21 | Israel | 34 | 78 | 1.044 | 1.32 | 0.28 |

| | | | | | | |
|----|--|------|------|-------|-------|-------|
| 22 | Denmark | 35 | 72 | 1.075 | 1.22 | 0.15 |
| 23 | Poland | 46 | 68 | 1.413 | 1.153 | -0.26 |
| 24 | Argentina | 24 | 54 | 0.737 | 0.91 | 0.18 |
| 25 | Mexico | 45 | 54 | 1.382 | 0.91 | -0.47 |
| 26 | Thailand | 30 | 53 | 0.921 | 0.89 | -0.02 |
| 27 | South Africa | 36 | 52 | 1.106 | 0.88 | -0.22 |
| | Total International collaborative papers | 3256 | 5899 | 100 | 100 | |

In terms of impact factor per paper during 2006, the largest impact (4.94) had been made by India's international collaborative papers with Switzerland, followed by papers with Argentina (4.44), Thailand (4.20), South Africa (4.16), Russia (4.01), Brazil (3.60), China (3.40), Denmark (3.24), Sweden (3.08), Canada (3.07), Netherlands (3.04), France (2.99), Australia (2.89), United Kingdom (2.84), Italy (2.82), United States (2.70), Spain (2.66), Mexico (2.65), Belgium (2.63), Israel (2.59), Singapore (2.56), Germany (2.50), Taiwan (2.48), South Korea (2.39), Japan (2.36), Malaysia (1.93) and Poland (1.80). The maximum increase (2.59) in impact factor per paper of the international collaborative papers recorded from papers with Thailand from 2001 to 2006, increasing from 1.59 to 4.20, followed by 2.48 with South Africa (from 1.68 to 4.16), 1.18 with Singapore (from 1.38 to 2.56), 1.12 with Sweden (from 1.96 to 3.08), 1.12 with Switzerland (from 3.80 to 4.92), 1.09 with Denmark (from 2.15 to 3.24), 1.00 with Canada (from 2.07 to 3.07), 0.95 with Russia (from 3.06 to 4.01), 0.93 (from 1.96 to 2.89) with Australia, 0.80 (from 2.80 to 3.60) with Brazil, 0.70 (from 1.78 to 2.48) with Taiwan, 0.57 (from 3.87 to 4.44) with Argentina, 0.54 (from 2.30 to 2.84) with United Kingdom, 0.52 (from 2.47 to 2.99) with France, 0.40 (1.96 to 2.36) with Japan, 0.36 (from 32.23 to 2.59) with Israel, etc. In contrast, there is a maximum decrease (1.16) in impact factor per paper with Poland (from 2.96 to 1.80) from 2001 to 2006, followed by 0.91 (from 3.30 to 2.39) with South Korea, 0.30 (from 2.95 to 2.65) with Mexico and 0.21 (from 3.25 to 3.04) with Netherlands (Table 27).

Table 27. Distribution of India's International Collaborative Papers and Impact by Major Countries

| S.No. | Collaborating Country | TICP | | Average IF/Paper | | |
|-------|-----------------------|------|------|------------------|------|------------|
| | | 2001 | 2001 | 2001 | 2006 | Difference |
| 1 | USA | 1238 | 1987 | 2.46 | 2.70 | 0.24 |
| 2 | Germany | 504 | 745 | 2.33 | 2.50 | 0.17 |
| 3 | UK | 368 | 662 | 2.30 | 2.84 | 0.54 |
| 4 | Japan | 326 | 631 | 1.96 | 2.36 | 0.40 |
| 5 | France | 290 | 477 | 2.47 | 2.99 | 0.52 |
| 6 | South Korea | 60 | 337 | 3.30 | 2.39 | -0.91 |
| 7 | Canada | 188 | 306 | 2.07 | 3.07 | 1.00 |
| 8 | China | 115 | 277 | 3.15 | 3.40 | 0.25 |
| 9 | Italy | 168 | 246 | 2.21 | 2.82 | 0.61 |
| 10 | Australia | 117 | 245 | 1.96 | 2.89 | 0.93 |
| 11 | Switzerland | 85 | 174 | 3.80 | 4.92 | 1.12 |

| | | | | | | |
|----|--|------|------|------|------|-------|
| 12 | Taiwan | 75 | 162 | 1.78 | 2.48 | 0.70 |
| 13 | Spain | 79 | 147 | 2.38 | 2.66 | 0.28 |
| 14 | Russia | 67 | 146 | 3.06 | 4.01 | 0.95 |
| 15 | Malaysia | 39 | 138 | 0.73 | 1.93 | 1.20 |
| 16 | Brazil | 65 | 120 | 2.80 | 3.60 | 0.80 |
| 17 | Netherlands | 107 | 118 | 3.25 | 3.04 | -0.21 |
| 18 | Singapore | 41 | 118 | 1.38 | 2.56 | 1.18 |
| 19 | Sweden | 63 | 103 | 1.96 | 3.08 | 1.12 |
| 20 | Belgium | 44 | 84 | 2.38 | 2.63 | 0.25 |
| 21 | Israel | 34 | 78 | 2.23 | 2.59 | 0.36 |
| 22 | Denmark | 35 | 72 | 2.15 | 3.24 | 1.09 |
| 23 | Poland | 46 | 68 | 2.96 | 1.80 | -1.16 |
| 24 | Argentina | 24 | 54 | 3.87 | 4.44 | 0.57 |
| 25 | Mexico | 45 | 54 | 2.95 | 2.65 | -0.30 |
| 26 | Thailand | 30 | 53 | 1.59 | 4.20 | 2.61 |
| 27 | South Africa | 36 | 52 | 1.68 | 4.16 | 2.48 |
| | Total International collaborative papers | 3256 | 5899 | 2.06 | 2.33 | 0.24 |

**Progress of Indian Science and Technology: Analysis of Publication Data
covered in Scopus Database, 2001 and 2006**

Progress in Indian Science and Technology: Analysis of Indian Publication Data as covered in Scopus Database, 2001 and 2006

The main objectives of the report are: (i) To study the distribution of S&T output across broad sectors, such as institutes of national importance, universities & colleges, R&D, and Industry; (ii) To identify the areas of strength and weakness of Indian S&T under broad subject fields; (iii) To study the geographical distribution of research output; (iv) To study the quality of research output, as reflected in impact factor and citations registered per paper; (v) To study the collaborative nature of S&T output; (vi) To analyze institutional productivity and quality; and (vii) To compare the status of Indian S&T publications output with select developed and developing countries, using international multidisciplinary and specialized subject databases.

1. World Publication Share

India's research publications share in the world output had increased from 1.86% in 2001 to 2.35% in 2006, and its world publication rank improved from 12th in 2001 to 11th in 2006 (Table 1). Similarly, India's share in world output in different subjects as reflected through their international bibliographical databases also showed increase. For example, India's share in world output increased from 6.13% in 2001 to 6.37% in 2006 in agricultural sciences (CAB database), from 2.43% in 2001 to 2.47% in biological sciences (BIOSIS database), from 2.50 in 2001 to 3.00% in chemical sciences (Chemical Abstracts database) and 2.34% to 2.66% in physics, electronics & computers (INSPEC database)(Table 2).

Table 1. Publication Output, Share & Rank of Top 20 Most Productive Countries

| S.No. | Country | Total Papers | | % Share of Papers | | World Publication Rank | |
|-------|-------------|--------------|---------|-------------------|------|------------------------|------|
| | | 2001 | 2006 | 2001 | 2006 | 2001 | 2006 |
| 1 | USA | 310,157 | 361,652 | 23.73 | 20.4 | 1 | 1 |
| 2 | UK | 83,415 | 114,426 | 6.381 | 6.47 | 2 | 3 |
| 3 | Japan | 90,432 | 110,357 | 6.918 | 6.24 | 3 | 4 |
| 4 | Germany | 80,709 | 102,823 | 6.174 | 5.81 | 4 | 5 |
| 5 | China | 61,233 | 184,422 | 4.685 | 10.4 | 5 | 2 |
| 6 | France | 57,049 | 74,033 | 4.364 | 4.18 | 6 | 6 |
| 7 | Canada | 39,214 | 63,296 | 3 | 3.58 | 7 | 7 |
| 8 | Italy | 40,791 | 59,831 | 3.121 | 3.38 | 8 | 8 |
| 9 | Russia | 32,673 | 31,560 | 2.5 | 1.78 | 9 | 14 |
| 10 | Spain | 28,409 | 46,903 | 2.173 | 2.65 | 10 | 9 |
| 11 | Australia | 26,625 | 42,056 | 2.037 | 2.38 | 11 | 10 |
| 12 | India* | 24,383 | 41,986 | 1.865 | 2.37 | 12 | 11 |
| 13 | Netherlands | 22,594 | 34,083 | 1.729 | 1.93 | 13 | 13 |
| 14 | South Korea | 18,744 | 38,685 | 1.434 | 2.19 | 14 | 12 |
| 15 | Sweden | 17,482 | 22,656 | 1.337 | 1.28 | 15 | 19 |
| 16 | Switzerland | 15690 | 24606 | 1.2 | 1.39 | 16 | 17 |
| 17 | Taiwan | 14155 | 26895 | 1.083 | 1.52 | 17 | 16 |
| 18 | Brazil | 13891 | 28006 | 1.063 | 1.58 | 18 | 15 |

| | | | | | | | |
|----|---------|-----------|-----------|------|------|----|----|
| 19 | Poland | 13980 | 22695 | 1.07 | 1.28 | 19 | 18 |
| 20 | Belgium | 12158 | 18405 | 0.93 | 1.04 | 20 | 20 |
| 21 | World | 1,307,139 | 1,769,789 | | | | |

**India's research output is less in this table because the publication data is collected directly from the Scopus database. For comparing India's research output with other countries, this data was necessary*

Table 2. India's World's Publication Share in different International Bibliographical Databases

| Database | Year | World Publication Output | Percentage Share in World Output | | | |
|-------------------------------------|------|--------------------------|----------------------------------|--------|--------|-------------|
| | | | India | China | Brazil | South Korea |
| Chemical Abstracts | 1997 | | 2.30% | 6.80% | 0.80% | 1.60% |
| | 2001 | | 2.50% | 9.80% | 1.20% | 2.10% |
| | 2006 | | 3.00% | 16.50% | 1.50% | 2.40% |
| CAB Database | 1996 | 212159 | 5.40 | 2.86 | 1.72 | 0.69 |
| | 2001 | 216621 | 6.13 | 3.96 | 3.12 | 1.04 |
| | 2006 | 142551 | 6.37 | 8.63 | 4.08 | 1.67 |
| INSPEC Database | 1996 | 322304 | 1.75 | 3.93 | 0.73 | 1.77 |
| | 2001 | 330210 | 1.79 | 8.51 | 1.15 | 2.98 |
| | 2006 | 386444 | 2.02 | 14.85 | 0.99 | 2.94 |
| BIOSIS | 1996 | 358538 | 2.52 | 1.63 | 1.06 | 0.84 |
| | 2001 | 355159 | 2.43 | 2.84 | 1.67 | 1.32 |
| | 2006 | 323933 | 2.47 | 5.76 | 2.01 | 1.92 |
| INSPEC-Physics Database | 1996 | 184010 | 2.31 | 4.13 | 0.83 | 1.52 |
| | 2001 | 189403 | 2.34 | 7.54 | 1.32 | 2.63 |
| | 2006 | 201002 | 2.66 | 13.18 | 1.20 | 2.72 |
| INSPEC-Computer & Control Abstracts | 1996 | 58535 | 0.85 | 3.07 | 0.67 | 1.56 |
| | 2001 | 54811 | 0.90 | 9.30 | 1.11 | 2.70 |
| | 2006 | 65684 | 1.26 | 20.91 | 1.00 | 2.78 |

2. Size of Research Output & Quality

India has published 26788 papers in 2001, which rose to 44150 papers, showing a growth rate of 64.81%. The impact of Indian research output has increased from 0.98 in 2001 to 1.27 in 2006 (Table 3). A significant share of Indian research output in S&T was published in low impact journals (IF between 0.001 to 1.999). It was 54.95% in 2001, which declined to 44.72% in 2006. Its share in medium impact journals (IF between 2 and 3.999) has been small (10.88%) in 2001, which increased to 16.71% in 2006. Similarly, its share in high impact journals (IF 4 and above) is even smaller, 4.22% in 2001, which increased to 5.61% in 2006. Besides, India's publication output is also being reported in zero impact journals. Its share in zero impact journals was 29.94% in 2001, which has increased to 32.96% in 2006 (Table 4).

Table 3. Growth and Impact of Indian Research Output during 2001 & 2006

| Publication Year | No. Of Papers | Total Impact Factor | Average Impact Factor per paper |
|------------------|---------------|---------------------|---------------------------------|
| 2001 | 26788 | 26287.032 | 0.981 |
| 2006 | 44150 | 56303.486 | 1.275 |

Table 4. Distribution of Indian Research Output by Impact Factor Range, 2001 & 2006

| IF Range | Number of Papers | | Share of Papers | |
|--------------|------------------|-------|-----------------|-------|
| | 2001 | 2006 | 2001 | 2006 |
| 0.0 – 0.0 | 8022 | 14550 | 29.94 | 32.96 |
| 0.1 – 1.99 | 14720 | 19743 | 54.95 | 44.72 |
| 2.0 – 3.99 | 2915 | 7378 | 10.88 | 16.71 |
| 4.0 & > 4.0 | 1131 | 2479 | 4.22 | 5.61 |
| Total Papers | 26788 | 44150 | 100 | 100 |

2. Publication Distribution by Sector

The universities & colleges sector contributed the largest publication share to the country output in S&T. In 2006, its publication share was 49.01%, followed by R&D sector (28.32%), institutes of national importance sector (19.34%), industry sector (4.20%) and others (10.05%). In terms of shift in their share to country's output during 2001 to 2006, universities & colleges witnessed the maximum increase of 6.98% (from 42.01% to 49.01%), followed by 3.55% (from 15.79% to 19.34%) in case of institutes of national importance and 1.38% (from 2.82% to 4.20%) in industry sector. The R&D sector, on the other hand, witnessed the decrease in national publication share by 4.47% (from 32.79% to 28.32%). The industry sector showed the fastest growth (145.83%) in its publication output from 2001 to 2006, followed by institutes of national importance sector (101.77%), universities & colleges sector (92.17%) and R&D sector (42.32%) (Table 5)

Table 5. Distribution of Papers by Broad Sectors, 2001 & 2006

| Sector | Publication Output | | % Share of Output | | Growth Rate |
|----------------------------------|--------------------|-------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| Universities & Colleges | 11259 | 21636 | 42.03 | 49.01 | 92.17 |
| R&D | 8785 | 12503 | 32.79 | 28.32 | 42.32 |
| Institute of National Importance | 4231 | 8537 | 15.79 | 19.34 | 101.77 |
| Industry | 755 | 1856 | 2.82 | 4.20 | 145.83 |
| Others | 2191 | 4438 | 8.179 | 10.05 | 102.56 |
| Total | 26788 | 44150 | 100 | 100 | 64.813 |

In terms of impact during 2006, the largest impact (1.47) has been made by R&D sector, followed by institutes of national importance sector (1.32), universities & colleges sector (0.93) and industry sector

(0.81). The R&D sector witnessed the maximum increase of 0.33 (from 1.14 to 1.47) in impact from 2001 to 2006, followed by increase of 0.28 (from 1.04% to 1.32%) in institutes of national importance sector, 0.24 (from 1.42% to 1.70%) in universities & colleges sector and 0.18 (from 0.63 to 0.81) in industry sector (Table 6)

Table 6. Distribution of Papers by Broad Sectors, 2001 & 2006

| Sector | Publication Output | | Average IF/Paper | | |
|----------------------------------|--------------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Univ & Colleges | 11259 | 21636 | 0.69 | 0.93 | 0.24 |
| R&D | 8785 | 12503 | 1.14 | 1.47 | 0.33 |
| Institute of National Importance | 4231 | 8537 | 1.04 | 1.32 | 0.28 |
| Industry | 755 | 1856 | 0.63 | 0.81 | 0.18 |
| Others | 2191 | 4438 | 0.77 | 0.98 | 0.21 |
| Total | 26788 | 44150 | 0.98 | 1.28 | 0.30 |

In terms of DST classification, the universities & colleges contributed the largest publication share to the country output in S&T. In 2006, its publication share was 45.84%, followed by research institutes sector (28.32%), institutes of national importance (28.32%), deemed universities (4.56%) and the other (13.91%). In terms of shift in their share to country's output from 2001 to 2006, universities & colleges witnessed the maximum increase of 5.58% (from 40.26% to 45.84%), followed by 3.54% (from 15.79% to 19.33%) in case of institutes of national importance and 2.28% (from 2.28% to 4.56%) in deemed universities. R&D sector, on the other hand, witnessed the decrease by 4.48% (from 32.80% to 28.32%). The deemed universities sector showed the fastest growth (229.79%) in its publication output from 2001 to 2006, followed by institutes of national importance (101.77%), universities & colleges sector (87.67%) and Research institutes (42.32) (Table 7). The highest impact (1.47) has been made by research institutes in 2006, followed by institutes of national importance (1.32), universities & colleges (0.94) and deemed universities (0.76). The research institutes witnessed the maximum increase in impact of 0.33 (from 1.14 to 1.47) from 2001 to 2006, followed by 0.28 (from 1.04% to 1.32%) in institutes of national importance sector, 0.24 (from 0.70 to 0.94) in universities & colleges and 0.21 (from 0.55 to 0.76) in deemed universities (Table 8).

Table 7. Growth & Distribution of Papers by Broad Sectors, 2001 & 2006 (DST Classification)

| Sector | Publication Output | | % Share of Output | | Growth Rate |
|-----------------------------------|--------------------|-------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| Univ & Colleges | 10785 | 20240 | 40.26 | 45.84 | 87.67 |
| Deemed Universities | 611 | 2015 | 2.28 | 4.56 | 229.79 |
| Research Institutes | 8786 | 12503 | 32.80 | 28.32 | 42.32 |
| Institutes of National Importance | 4231 | 8537 | 15.79 | 19.34 | 101.77 |
| Others | 2923 | 6143 | 10.91 | 13.91 | 110.16 |
| Total | 26788 | 44150 | 100 | 100 | 64.813 |

Table 8. Distributions of Papers and Impact by Broad Sectors, 2001 & 2006(DST Classification)

| Sector | Publication Output | | Average IF/Paper | | |
|-----------------------------------|--------------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Univ & Colleges | 10785 | 20240 | 0.70 | 0.94 | 0.24 |
| Deemed Universities | 611 | 2015 | 0.55 | 0.76 | 0.21 |
| Research Institutes | 8786 | 12503 | 1.14 | 1.47 | 0.33 |
| Institutes of National Importance | 4231 | 8537 | 1.04 | 1.32 | 0.28 |
| Others | 2923 | 6143 | 0.73 | 0.93 | 0.20 |
| Total | 26788 | 44150 | 0.98 | 1.28 | 0.30 |

2.1 Universities & Colleges Sector

Among the universities & colleges sector, the universities had made the last contribution (57.97%) in 2006, followed by colleges (44.14%), deemed universities (9.31%) and inter-universities (1.83%). The contribution of universities had decreased by 6.25% (from 64.22% to 57.97%) from 2001 to 2006, while that of others increased: colleges by 7.86% (from 36.28% to 44.14%), deemed universities by 3.87% (from 5.44% to 9.31%) and inter-university centers by 0.98% (from 0.85% to 1.83%). In terms of growth from 2001 to 2006, inter-universities recorded the highest growth (313.54%), followed by deemed universities (229.25%), colleges (133.78%) and universities (73.47%), have recorded the largest (169.28%)(Table 9). In terms of impact as measured by impact factor, the largest impact (1.45) was scored by inter-university centers during 2006, followed by universities (1.08), colleges (0.93) and deemed universities (0.76). The universities showed the maximum increase of 0.32 (from 0.76 to 1.08) in impact from 2001 to 2006, followed by 0.21% (from 0.55 to 0.76) in deemed universities, 0.17 (from 0.57 to 0.74) in colleges, as against decrease by 0.83 (from 2.28 to 1.45) in inter-university centers (Table 10).

Table 9. Growth & Distribution of Papers in Universities & Colleges Sector

| Sector | Publication Output | | % Share of Output | | Growth Rate 2001 to 2006 |
|-------------------|--------------------|-------|-------------------|-------|-----------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| Universities | 7230 | 12542 | 64.22 | 57.97 | 73.47 |
| Deemed University | 612 | 2015 | 5.44 | 9.31 | 229.25 |
| Interuniversity | 96 | 397 | 0.85 | 1.83 | 313.54 |
| Colleges | 4085 | 9550 | 36.28 | 44.14 | 133.78 |
| Total | 11259 | 21636 | 100 | 100 | 92.17 |

Table 10. Distribution of Papers and Impact in Universities & Colleges Sector

| Sector | Publication Output | | Average IF/Paper Growth Rate | | |
|-------------------|--------------------|-------|---------------------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Universities | 7230 | 12542 | 0.76 | 1.08 | 0.32 |
| Deemed University | 612 | 2015 | 0.55 | 0.76 | 0.21 |
| Interuniversity | 96 | 397 | 2.28 | 1.45 | -0.83 |
| Colleges | 4085 | 9550 | 0.57 | 0.74 | 0.17 |
| Total | 11259 | 21636 | 0.69 | 0.93 | 0.24 |

2.2 R&D Sector

Among the R&D sector, the Council of Scientific & Industrial Research (CSIR) research institutes had made the maximum contribution (with 33.36% share) in 2006, followed by Department of Atomic Energy (DAE)(23.89% share) research institutes, Indian Council of Agricultural Research (ICAR)(13.48% share) research institutes, Department of Science & Technology (DST) (10.54% share) research institutes, Ministry of Health & Family Welfare (MHFW)(8.28% share) research institutes, Defense Research & Development Organization (DRDO)(5.31% share) research institutes, Department of Space (DOS)(5.12%) research institutes, Indian Council of Medical Research (ICMR)(4.57% share) research institutes, etc. Among the major science departments/agencies, the contribution of CSIR has increased from 2001 to 2006 by 0.96% (from 32.40% to 33.36%), followed by ICAR by 0.53% (from 12.95% to 13.48%), DRDO by 1.04% (from 4.27% to 5.31%), DOS by 1.0 (from 4.12% to 5.12%), ICMR by 0.02 (from 4.55% to 4.57%), MHRD by 0.34 (from 0.865 to 1.20), MOM by 0.04 (from 1.16% to 1.20%), MOWR by 0.37 (from 0.56% to 0.93%), DBT by 0.32% (from 1.87% to 2.19%), MOWR by 0.29% (from 0.47% to 0.76%), MOER by 0.55% (from 0.21 to 0.76), MOHA by 0.20 (from 0.19 to 0.39), etc. In contrast, the contribution of DST has decreased by 2.0% (from 12.54% to 10.54%), DAE has decreased from 2001 to 2006 by 0.49% (from 24.38% to 23.89%), MHFW by 2.38% (from 10.66% to 8.28%), DBT by 0.04% (from 1.99% to 1.95%), MOEN by 1.75% (3.03% to 1.28%), MOTX by 0.27% (from 1.49% to 1.22%), MOWR by 0.37 (from 0.56 to 0.93), etc. In terms of growth from 2001 to 2006, the highest growth of 623.53% was achieved by MOCF-DCP, followed by MOER (440%), MNCES (250%), MOHA (192.96%), DOE (150%), MOWR (147.50%), MHRD (104.84%), DOS (84.07%), DRDO (83.99%), etc. (Table 11).

Table 11. Growth & Distribution of Papers under Research Institutes by Agencies/Departments

| Sector | Publication Output | | % Share of Output | | Growth from 2001 to 2006 |
|----------|--------------------|------|-------------------|-------|--------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| CSIR | 2322 | 3539 | 32.40 | 33.36 | 52.41 |
| DAE | 1747 | 2534 | 24.38 | 23.89 | 45.05 |
| ICAR | 928 | 1430 | 12.95 | 13.48 | 54.09 |
| DST | 899 | 1118 | 12.54 | 10.54 | 24.36 |
| MHFW | 764 | 879 | 10.66 | 8.28 | 15.05 |
| DRDO | 306 | 563 | 4.27 | 5.31 | 83.99 |
| DOS | 295 | 543 | 4.12 | 5.12 | 84.07 |
| ICMR | 326 | 485 | 4.55 | 4.57 | 48.77 |
| DBT | 143 | 207 | 1.99 | 1.95 | 44.75 |
| MOEN | 217 | 136 | 3.03 | 1.28 | -37.33 |
| MOTX | 107 | 129 | 1.49 | 1.22 | 20.56 |
| MHRD | 62 | 127 | 0.86 | 1.2 | 104.84 |
| MOM | 83 | 127 | 1.16 | 1.2 | 53.01 |
| MOCF-DCP | 17 | 123 | 0.24 | 1.16 | 623.53 |
| MOWR | 40 | 99 | 0.56 | 0.93 | 147.50 |
| MOER | 15 | 81 | 0.21 | 0.76 | 440.00 |
| MOIT | 33 | 44 | 0.46 | 0.41 | 33.33 |
| MOHA | 14 | 41 | 0.19 | 0.39 | 192.86 |

| | | | | | |
|---------|------|-------|------|------|--------|
| MOC-DOC | 21 | 32 | 0.29 | 0.30 | 52.38 |
| MOP | 16 | 17 | 0.22 | 0.16 | 6.25 |
| DOE | 6 | 15 | 0.08 | 0.14 | 150.00 |
| MOD | 21 | 13 | 0.29 | 0.12 | -38.09 |
| MNCES | 2 | 7 | 0.03 | 0.07 | 250.00 |
| Total | 7166 | 10609 | | | |

The largest impact (2.51) during 2006 was scored by DBT, followed by DST (2.32), MOCF-DCP (2.03), DAE (1.84), MNCES (1.80), CSIR (1.61), ICMR (1.37), MHFW (1.35), MOER (1.26), MOC-DOC (1.20), DOE (1.13), MOHA (1.13), DRDO (1.07), DOS (1.07), MOIT (1.05), MOM (1.01), ICAR (0.92), MOWR (0.90), MOP (0.81), MHRD (0.78), MOEN (0.69), MOD (0.33) and MOTX (0.25). The maximum increase (1.02) in impact factor from 2001 to 2006 was scored by DBT increasing from 1.49 to 2.51, followed by 0.61% (from 0.59 to 1.20) in MOC-DOC, 0.60 (from 0.45 to 1.05) in MOIT, 0.54 (from 1.78 to 2.32) in DST, 0.50 (from 0.51 to 1.01) in MOM, 0.49 (from 0.64 to 1.13) in DOE. In contrast, there is a decrease in impact in three agencies/departments, such as DOS, MOTX and MOD (Table 12).

Table 12. R&D Sector: Distribution of Papers & Impact by Major Funding Agencies

| Agency/ Department | Total Papers | | Average IF/Paper | | |
|-----------------------|--------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| CSIR | 2322 | 3539 | 1.26 | 1.61 | 0.35 |
| DAE | 1747 | 2534 | 1.69 | 1.84 | 0.15 |
| ICAR | 928 | 1430 | 0.47 | 0.92 | 0.45 |
| DST | 899 | 1118 | 1.78 | 2.32 | 0.54 |
| MHFW | 764 | 879 | 0.87 | 1.35 | 0.48 |
| DRDO | 306 | 563 | 0.73 | 1.07 | 0.34 |
| DOS | 295 | 543 | 1.56 | 1.07 | -0.49 |
| ICMR | 326 | 485 | 0.98 | 1.37 | 0.39 |
| DBT | 143 | 207 | 1.49 | 2.51 | 1.02 |
| MOEN | 217 | 136 | 0.40 | 0.69 | 0.29 |
| MOTX | 107 | 129 | 0.26 | 0.25 | -0.01 |
| MHRD | 62 | 127 | 0.35 | 0.78 | 0.43 |
| MOM | 83 | 127 | 0.51 | 1.01 | 0.50 |
| MOCF-DCP | 17 | 123 | 1.71 | 2.03 | 0.32 |
| MOWR | 40 | 99 | 0.43 | 0.90 | 0.47 |
| MOER | 15 | 81 | 0.80 | 1.26 | 0.46 |
| MOIT | 33 | 44 | 0.45 | 1.05 | 0.60 |
| MOHA | 14 | 41 | 0.83 | 1.13 | 0.30 |
| MOC-DOC | 21 | 32 | 0.59 | 1.20 | 0.61 |
| MOP | 16 | 17 | 0.41 | 0.81 | 0.40 |
| DOE | 6 | 15 | 0.64 | 1.13 | 0.49 |
| MOD | 21 | 13 | 0.97 | 0.33 | -0.64 |
| MNCES | 2 | 7 | 0.24 | 1.80 | 1.56 |
| Total | 7166 | 10609 | 100 | 100 | |

CSIR=Council of Scientific & Industrial Research; DAE=Department of Atomic Energy; DBT=Department of Biotechnology; DOE=Department of Electronics; DOS=Department of Space;

DRDO=Defense Research & Development Organization; DST=Department of Science & Technology; ICAR=Indian Council of Agricultural Research; ICMR=Indian Council of Medical Research; MHFW=Ministry of Health & Family Welfare; MHRD=Ministry of Human Resource Development; MNCES=Ministry of Non-Conventional Energy Resources; MOC-DOC=Ministry of Commerce-Department of Commerce; MOCF-DCP=Ministry of Chemicals & Fertilizers-Department of Chemicals & Petrochemicals; MOD=Ministry of Defense; MOEN=Ministry of Environment & Forests; MOER=Ministry of Earth Resources; MOHA=Ministry of Home Affairs; MOIT=Ministry of Information Technology & Communications; MOM: Ministry of Mines; MOP: Ministry of Mines; MOP: Ministry of Power; MOTX=Ministry of Textiles; MOWR: Ministry of Water Resources; MPNG: Ministry of Petroleum & Natural Gas;

2.3 Industry Sector

Under the industry sector, private sector had made the larger contribution of 89.39% during 2006, followed by public sector (11.53%) during 2006. The contribution of private sector has decreased from 96.56% in 2001 to 89.39% in 2006, against increase of public sector from 3.57% to 11.53% during the same period. In terms of impact during 2006, the largest impact (0.84) was made by private sector, followed by public sector (0.55). The impact of both private and public sector has increased from 0.64 and 0.34 in 2001 to 0.84 and 0.55 in 2006 (Table 13 & 14).

Table 13. Growth & Distribution of Papers in Industry Sector

| Sector | Publication Output | | % Share of Output | | Growth Rate |
|------------------|--------------------|------|-------------------|-------|--------------|
| | 2001 | 2006 | 2001 | 2006 | 2001 to 2006 |
| Public Industry | 27 | 214 | 3.57 | 11.53 | 692.59 |
| Private Industry | 729 | 1659 | 96.56 | 89.39 | 127.57 |
| Total | 755 | 1856 | 100 | 100 | 145.83 |

Table 14. Distribution of Papers & Impact in Industry Sector

| Sector | Publication Output | | Average IF/Paper | | |
|------------------|--------------------|------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Public Industry | 27 | 214 | 0.34 | 0.55 | 0.21 |
| Private Industry | 729 | 1659 | 0.64 | 0.84 | 0.20 |
| Total | 755 | 1856 | 0.63 | 0.81 | 0.18 |

2.4 Others

Among the others, hospitals had made the highest contribution of 40.58% during 2006, followed by individuals (33.33%), associations, societies and academies (13.50%), research institutions (9.37%), foundations (7.01%) and trusts (1.85%). The contribution of individuals, research institutions and foundations has decreased, as against increase in case of hospitals, associations, societies & academies, trusts and others from 2001 to 2006. In terms of publication growth from 200 to 2006, the highest

(470.48%) was achieved by associations, societies & academies, followed by trusts (156.25%), hospitals (116.73%), foundations (84.02%), and individuals (75.03%)(Table 15 & 16)

Table 15. Growth & Distribution of Papers in Others

| Sector | Publication Output | | % Share of Output | | Growth Rate from 2001 to 2006 |
|-------------------------------------|--------------------|------|-------------------|-------|-------------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| Individuals | 845 | 1479 | 38.57 | 33.33 | 75.03 |
| Hospitals | 831 | 1801 | 37.93 | 40.58 | 116.73 |
| Research Institutions | 280 | 416 | 12.78 | 9.37 | 48.57 |
| Foundations | 169 | 311 | 7.71 | 7.01 | 84.02 |
| Associations, Societies & Academies | 105 | 599 | 4.79 | 13.50 | 470.48 |
| Trusts | 32 | 82 | 1.46 | 1.85 | 156.25 |
| Others | 21 | 134 | 0.96 | 3.02 | 538.10 |
| Total | 2191 | 4438 | 100 | 100 | 102.56 |

Table 16. Distribution of Papers and Impact in Others

| Sector | Publication Output | | Average IF/Paper | | |
|-------------------------------------|--------------------|------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Individuals | 845 | 1479 | 0.68 | 0.71 | 0.03 |
| Hospitals | 831 | 1801 | 0.78 | 1.04 | 0.26 |
| Research Institutions | 280 | 416 | 0.95 | 1.36 | 0.41 |
| Foundations | 169 | 311 | 0.90 | 1.10 | 0.20 |
| Associations, Societies & Academies | 107 | 599 | 0.79 | 0.90 | 0.11 |
| Trusts | 32 | 82 | 0.71 | 1.39 | 0.68 |
| Others | 21 | 134 | 1.19 | 1.52 | 0.33 |
| Total | 2191 | 4438 | 0.77 | 0.98 | 0.21 |

3. Subject-Wise Analysis

The country total research output during 2001 and 2006 has been classified under 20 broad subjects, using Scopus database classification. Of the 20 broad subjects, medicine, chemistry, engineering, biochemistry, genetics & molecular biology and agricultural & biological sciences were considered as the major productive subject areas of Indian S&T. The combined research output of these five subject areas have increased from 16425 papers to 28762 papers and publication share in total country output from 61.31% to 65.15% from 2001 to 2006. Their individual publication share of these five subject areas ranges from 8.09% to 19.848% during 2001 and 2006 (Table 17).

In terms of activity index, there was a growth in research activity in medicine increasing from 92.83 to 104.3, engineering (from 82.62 to 110.5) and biochemistry, genetics & molecular biology (from 90.25 to 105.9), as against decrease in research activity in chemistry (from 103.7 to 98.14) and agricultural & biological sciences (from 11.69 to 92.90) from 2001 to 2006(Table 18).

The maximum growth (120.5%) of publications output had been recorded by engineering, followed by biochemistry, genetics & molecular biology (93.43%) and medicine (85.26%). Only chemistry and agricultural & biological sciences have recorded growth less than the national publication growth (64.81%) from 2001 to 2006 (Table 17).

Among the most productive subject areas, the maximum impact (1.92) was made by biochemistry, genetics & molecular biology during 2006, followed by chemistry (1.63), medicine (1.43), agricultural & biological sciences (0.83) and engineering (0.37). The impact increased by 0.51 in medicine from 2001 to 2006, followed by 0.46 in chemistry, 0.38 in agricultural & biological sciences, 0.12 in engineering and 0.08 in biochemistry, genetics & molecular biology (Table 19).

Materials science, physics & astronomy, earth & planetary sciences, environmental sciences, computer science, chemical engineering, pharmacology, toxicology & pharmaceuticals, mathematics and immunology & microbiology were the nine medium productive subject areas of Indian S&T. The combined research output of these nine subject areas have increased from 9592 papers to 16734 papers and combined publication share in the country output from 35.81% to 37.90% from 2001 to 2006. The individual publication share of these nine subject areas ranges from 1.91% to 6.7% (Table 17).

In terms of activity index, there was growth in research activity in computer science, rising from 66.57 to 120.3, followed by pharmacology, toxicology & pharmaceuticals (from 76.20 to 114.4), materials science (from 98.72 to 100.8), Immunology & microbiology (from 85.45 to 108.8) and physics & astronomy (from 99.39 to 100.4), as against decrease in research activity in mathematics (from 101.39 to 99.16), chemical engineering (from 104.56 to 97.24), earth & planetary sciences (112.09 to 92.66) and environmental sciences (from 104.97 to 96.98) from 2001 to 2006 (Table 18).

The maximum growth (197.79%) of publications output has been recorded by computer science, followed by pharmacology, toxicology & pharmaceuticals (147.49%), immunology & microbiology (109.6), materials science (68.26%) and physics & astronomy (66.43%). Only mathematics (61.18%), chemical engineering (53.27%), environmental sciences (52.26%) and earth & planetary sciences (36.24%) have recorded growth less than the national publication growth (64.81%) from 2001 to 2006 (Table 17).

Among the medium productive subject areas, the maximum impact (2.12) was made by immunology & microbiology during 2006, followed by physics & astronomy (1.91), earth & planetary sciences (1.37), chemical engineering (1.24), materials science (1.08), mathematics (1.05), pharmacology, toxicology & pharmaceuticals (1.02), environmental sciences (0.62) and computer science (0.42). The impact increased by 0.61 in chemical engineering from 2001 to 2006, followed by environmental sciences

(0.35), earth & planetary sciences (0.032), pharmacology, toxicology & pharmaceuticals (0.25), materials science (0.20) and immunology & microbiology (0.04), against decrease by 0.16% in mathematics, followed by computer science (0.09) and physics & astronomy (0.07) (Table 19).

Neuroscience, veterinary science, energy, public health, dentistry and nursing are the six low productive subject areas of Indian S&T. The combined research output of these six subject areas have increased from 1187 papers to 1851 papers from 2001 to 2006, while their combined publications share in the country output have decreased from 4.43% to 4.19% from 2001 to 2006. The individual publication share of these six subject areas ranges from 0.16% to 1.42%(Table 17).

In terms of activity index, there was growth in research activity in energy (from 56.41 to 126.5) and dentistry (from 89.42 to 106.4), as against decrease in research activity in neuroscience (from 100.41 to 99.75), veterinary science (125.16 to 84.73), public health (from 111.71 to 92.89) and nursing (from 129.51 to 82.1) from 2001 to 2006(Table 18).

The maximum growth (269.5%) of publications output has been recorded by energy, followed by dentistry (96.15%) and neuroscience (63.74). Only public health (37.05), veterinary science (11.58) and nursing (4.48) have recoded growth less than the national publication growth (58.99%) from 2001 to 2006(Table 17).

Among the low productive subjects, the maximum impact (2.35) was made by neuroscience during 2006, followed public health (1.30), nursing (1.29), dentistry (0.22), energy (0.58) and veterinary science (0.15). The impact increased by 0.50 in public health from 2001 to 2006, followed by neuroscience (0.45), dentistry (0.22), energy (0.13) and veterinary science (0.03), against decrease by 0.50 in nursing (Table 19).

Table 17. Growth & Distribution of Papers & Impact by Broad Main Subjects, 2001 & 2006

| Main Subjects | Publication Output | | % Share in National Output | | Growth from 2001 to 2006 |
|-----------------------------|--------------------|------|----------------------------|-------|--------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| Medicine | 4728 | 8759 | 17.65 | 19.84 | 85.26 |
| Chemistry | 3875 | 6081 | 14.47 | 13.77 | 56.93 |
| Engineering | 2168 | 4781 | 8.09 | 10.83 | 120.5 |
| Bioch, Genetics & Mol. Biol | 2467 | 4772 | 9.21 | 10.81 | 93.43 |
| Agri & Biol. Sci | 3187 | 4369 | 11.90 | 9.90 | 37.09 |
| Materials Science | 1761 | 2963 | 6.57 | 6.71 | 68.26 |
| Phys & Astronomy | 1698 | 2826 | 6.34 | 6.40 | 66.43 |
| Earth & Planetary Sci | 1352 | 1842 | 5.05 | 4.17 | 36.24 |
| Environmental Sci. | 1192 | 1815 | 4.45 | 4.11 | 52.27 |
| Computer Science | 589 | 1754 | 2.20 | 3.97 | 197.8 |
| Chemical Engineering | 1038 | 1591 | 3.87 | 3.60 | 53.28 |
| Pharmacology, Toxic & | 617 | 1527 | 2.30 | 3.46 | 147.5 |

| | | | | | |
|---------------------------|-------|-------|------|------|-------|
| Mathematics | 832 | 1341 | 3.11 | 3.04 | 61.18 |
| Immunology & Microbiology | 513 | 1075 | 1.91 | 2.43 | 109.6 |
| Neuroscience | 342 | 560 | 1.28 | 1.27 | 63.74 |
| Veterinary Science | 380 | 424 | 1.42 | 0.96 | 11.58 |
| Energy | 95 | 351 | 0.35 | 0.79 | 269.5 |
| Public Health | 251 | 344 | 0.94 | 0.78 | 37.05 |
| Dentistry | 52 | 102 | 0.19 | 0.23 | 96.15 |
| Nursing | 67 | 70 | 0.25 | 0.16 | 4.48 |
| Total | 26788 | 44150 | 100 | 100 | 64.81 |

Table 18. Distribution of Papers & Activity Index in 2001 & 2006

| Main Subjects | Number of Papers | | Activity Index | |
|---------------------------|------------------|-------|----------------|-------|
| | 20001 | 2006 | 20001 | 2006 |
| Medicine | 4728 | 8759 | 92.833 | 104.3 |
| Chemistry | 3875 | 6081 | 103.07 | 98.14 |
| Engineering | 2168 | 4781 | 82.618 | 110.5 |
| Bioch, Genetics & | 2467 | 4772 | 90.246 | 105.9 |
| Agri & Biol. Sci | 3187 | 4369 | 111.69 | 92.9 |
| Materials Science | 1761 | 2963 | 98.72 | 100.8 |
| Phys & Astronomy | 1698 | 2826 | 99.39 | 100.4 |
| Earth & Planetary Sci | 1352 | 1842 | 112.09 | 92.66 |
| Environmental Sci. | 1192 | 1815 | 104.97 | 96.98 |
| Computer Science | 589 | 1754 | 66.57 | 120.3 |
| Chemical Engineering | 1038 | 1591 | 104.56 | 97.24 |
| Pharmacology, Toxic & | 617 | 1527 | 76.208 | 114.4 |
| Mathematics | 832 | 1341 | 101.39 | 99.16 |
| Immunology & Microbiology | 513 | 1075 | 85.547 | 108.8 |
| Neuroscience | 342 | 560 | 100.41 | 99.75 |
| Veterinary Science | 380 | 424 | 125.16 | 84.73 |
| Energy | 95 | 351 | 56.406 | 126.5 |
| Public Health | 251 | 344 | 111.71 | 92.89 |
| Dentistry | 52 | 102 | 89.417 | 106.4 |
| Nursing | 67 | 70 | 129.51 | 82.1 |
| Total | 26788 | 44150 | 100 | 100 |

Table 19. Distribution of Papers & Impact in 2001 & 2006

| Main Subjects | Publication Output | | Impact Factor per Paper | | |
|-----------------------------|--------------------|------|-------------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Medicine | 4728 | 8759 | 0.92 | 1.43 | 0.51 |
| Chemistry | 3875 | 6081 | 1.17 | 1.63 | 0.46 |
| Engineering | 2168 | 4781 | 0.25 | 0.37 | 0.12 |
| Bioch, Genetics & Mol. Biol | 2467 | 4772 | 1.84 | 1.92 | 0.08 |
| Agri & Biol. Sci | 3187 | 4369 | 0.45 | 0.83 | 0.38 |
| Materials Science | 1761 | 2963 | 0.88 | 1.08 | 0.2 |
| Phys & Astronomy | 1698 | 2826 | 1.98 | 1.91 | -0.07 |
| Earth & Planetary Sci | 1352 | 1842 | 1.05 | 1.37 | 0.32 |
| Environmental Sci. | 1192 | 1815 | 0.27 | 0.62 | 0.35 |
| Computer Science | 589 | 1754 | 0.51 | 0.42 | -0.09 |
| Chemical Engineering | 1038 | 1591 | 0.63 | 1.24 | 0.61 |
| Pharmacology, Toxic & | 617 | 1527 | 0.77 | 1.02 | 0.25 |
| Mathematics | 832 | 1341 | 1.21 | 1.05 | -0.16 |

| | | | | | |
|---------------------------|-------|-------|------|------|------|
| Immunology & Microbiology | 513 | 1075 | 2.08 | 2.12 | 0.04 |
| Neuroscience | 342 | 560 | 1.90 | 2.35 | 0.45 |
| Veterinary Science | 380 | 424 | 0.12 | 0.15 | 0.03 |
| Energy | 95 | 351 | 0.45 | 0.58 | 0.13 |
| Public Health | 251 | 344 | 0.80 | 1.30 | 0.50 |
| Dentistry | 52 | 102 | 0.37 | 0.59 | 0.22 |
| Nursing | 67 | 70 | 1.79 | 1.29 | -0.5 |
| Total | 26788 | 44150 | 0.98 | 1.28 | 0.3 |

In terms of DST classification, the maximum contribution (10722 papers with 24.28% share) was made by engineering & technology during 2006, followed by medical sciences (9562 papers with 21.66% share), agricultural sciences (9113 papers with 20.64% share), chemical sciences (6081 papers with 13.77% share), physical sciences (4661 papers with 10.56% share), earth & environmental sciences (1815 papers with 4.11% share) and mathematics (1341 papers with 3.04% share). The national publication share of engineering & technology increased by 3.22% (from 21.06% to 24.28%) and by 1.5% (from 20.08% to 21.66%) in medical sciences from 2001 to 2006, as against decrease by 0.86% (from 11.42% to 10.56%) in physical sciences, followed by 0.70% (from 24.77% to 13.77%) in chemical sciences, 0.44% (from 21.08% to 20.64%) in agricultural sciences, 0.38% (from 4.49% to 4.11%) in earth & environmental sciences and 0.18% (from 3.22 to 3.04%) in mathematics during the same period. In terms of activity index, there was increase in activity in engineering & technology from 91.30 to 105.28 and medical sciences from 95.32 to 102.84, against decrease in activity index from 103.31 to 99.20 in agricultural sciences, 103.07 to 98.14 in chemical sciences, 105.61 to 96.60 in earth & environmental sciences, 103.76 to 97.72 in mathematics and 104.91 to 97.02 in physical sciences from 2001 to 2006. The largest impact (1.70) was made by physical sciences during 2006, followed by 1.63 from chemical sciences, 1.39 from agricultural sciences, 1.36 from medical sciences, 1.05 from mathematics, 0.71 from engineering & technology and 0.62 from earth & environmental sciences during 2006. Except mathematics, there was an increase in impact factor per paper from 2001 to 2006 by 0.49 from medical sciences, followed by chemical sciences (0.46), earth & environmental sciences (0.35), agricultural sciences (0.34), engineering & technology (0.15) and physical sciences (0.14) (Tables 20 to 22).

Table 20. Growth & Distribution of Papers by Broad Main Subjects, 2001 & 2006 (DST Classification)

| Main Subjects | Publication Output | | % Share in National Output | | Growth from 2001 to 2006 |
|-------------------------|--------------------|-------|----------------------------|-------|--------------------------|
| | 2001 | 2006 | 2001 | 2006 | |
| Engn & Tech | 5642 | 10722 | 21.06 | 24.28 | 90.04 |
| Medical Sciences | 5378 | 9562 | 20.08 | 21.66 | 77.8 |
| Agricultural Sciences | 5647 | 9113 | 21.08 | 20.64 | 61.38 |
| Chemical Sciences | 3875 | 6081 | 14.47 | 13.77 | 56.93 |
| Physical Sciences | 3058 | 4661 | 11.42 | 10.56 | 52.42 |
| Earth & Envir. Sciences | 1204 | 1815 | 4.49 | 4.11 | 50.75 |
| Mathematics | 864 | 1341 | 3.22 | 3.04 | 55.21 |
| Total | 26788 | 44150 | 100 | 100 | 64.81 |

Table 21. Distribution of Papers and Activity Index by Broad Main Subjects, 2001 & 2006 (DST Classification)

| Main Subjects | Publication Output | | Activity Index | |
|-------------------------|--------------------|-------|----------------|--------|
| | 2001 | 2006 | 2001 | 2006 |
| Agricultural Sciences | 5647 | 9113 | 101.31 | 99.20 |
| Chemical Sciences | 3875 | 6081 | 103.07 | 98.14 |
| Earth & Envir. Sciences | 1204 | 1815 | 105.61 | 96.60 |
| Engn & Tech | 5642 | 10722 | 91.30 | 105.28 |
| Mathematics | 864 | 1341 | 103.76 | 97.72 |
| Medical Sciences | 5378 | 9562 | 95.32 | 102.84 |
| Physical Sciences | 3058 | 4661 | 104.91 | 97.02 |
| Total | 26788 | 44150 | 100 | 100 |

Table 22. Distribution of Papers by Number & Impact, 2001 & 2006 (DST Classification)

| Main Subjects | No. of Papers | | Average IF/Paper | | |
|-------------------------|---------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Agricultural Sciences | 5647 | 9113 | 1.05 | 1.39 | 0.34 |
| Chemical Sciences | 3875 | 6081 | 1.17 | 1.63 | 0.46 |
| Earth & Envir. Sciences | 1204 | 1815 | 0.27 | 0.62 | 0.35 |
| Engn & Tech | 5642 | 10722 | 0.56 | 0.71 | 0.15 |
| Mathematics | 864 | 1341 | 1.16 | 1.05 | -0.11 |
| Medical Sciences | 5378 | 9562 | 0.87 | 1.36 | 0.49 |
| Physical Sciences | 3058 | 4661 | 1.56 | 1.70 | 0.14 |
| Total | 26788 | 44150 | 0.98 | 1.28 | 0.30 |

4. International Collaboration

India is having international collaboration with a large number of developed and developing countries for research pursuits in science and technology. Based on publications output data for India in science and technology, it was found that its average annual share of international collaborative papers to its total cumulative publication output of India has increased from 16.19% in 2001 to 23.33% in 2006. The average impact factor per paper of the total India's international collaborative papers had increased from 1.77 during 2001 to 2.04 during 2006 (Table 23)

During 2006, the largest share (50.36%) of India's international collaborative papers had come from North America, followed by Europe (42.02%), Asia (31.08%), Oceania (3.32%), South America (2.47%) and Africa (2.28%). The largest decrease (10.19%) in international collaborative papers share with India had come from North America (from 60.55% to 50.36%) from 2001 to 2006, followed by 2.90% (from 44.92% to 42.02%) in Europe, 1.69% (from 3.97% to 2.28%) in Africa and by 0.20% (from 3.26 to 3.46) in South America. In contrast, the international collaborative publication share has increased by 1.13% (from 3.32% to 4.45%) in Oceania from 2001 to 2006, followed by 0.35% (from 2.12% to 2.47%) in South America (Table 24).

The largest impact (3.29) of the India's international collaborative papers during 2006 have been made by international collaborative papers with South America, followed by North America (2.47), Oceania (2.47), Africa (2.46), Europe (2.34) and Asia (1.73). The largest increase (1.27) in impact from 2001 to 2006 had been made by papers from Africa increasing from 1.19 to 2.46, followed by 0.95 (from 2.34 to 3.29) from papers with South America, 0.65 (from 1.82 to 2.47) from papers with Oceania, 0.54 (from 1.93 to 2.47) from papers with North America, 0.40 (from 1.94 to 2.34) from papers with Europe and 0.23 (from 1.50 to 1.73) from papers with Asia (Table 25).

Among the top 25 countries collaborating with India, the leading ones are: United States with 46.79% share in the total international collaborative publications output during 2006, followed by Japan (14.25% share), France (14.07% share), UK (10.76% share), Germany (9.75% share), Canada (4.62% share), Australia (3.98% share), South Korea (3.85%), China (3.30% share), Italy (3.11% share), Malaysia (2.95% share), Switzerland (2.48% share), Netherlands (2.32% share), Taiwan (2.12% share), Spain (1.90%), Russia (1.60% share), Singapore (1.59% share), Sweden (1.57% share), Brazil (1.56% share), Belgium (1.26% share), Israel (0.89% share), Denmark (0.81% share), Poland (0.81% share), Thailand (0.73% share), Mexico (0.73%), Argentina (0.63%) and South Africa (0.63% share) (Table 26).

The largest increase (2.47%) in international collaborative publication share with India from 2001 to 2006 had been made by South Korea rising from 1.38% to 3.85%, followed by 2.02% (from 8.74% to 10.76%) with United Kingdom, by 0.96% (from 3.02% to 3.98%) with Australia, by 0.90% (from 2.05% to 2.95%) with Malaysia, by 0.90% (from 1.22% to 2.12%) with Taiwan, by 0.84% (from 1.64% to 2.48%) with Switzerland, by 0.74% (from 0.85% to 1.59%) with Singapore, by 0.56% (from 2.74% to 3.30%) in China, by 0.27% (from 1.29% to 1.56%) with Brazil, 0.22% (from 0.51% to 0.73%) with Thailand and 0.15% (from 1.11% to 1.261%) with Belgium. In contrast, the largest decrease (9.54%) in international collaborative publication share with India from 2001 to 2006 was witnessed by United States (from 56.33% to 46.79%), followed by 5.03% (from 19.28% to 14.25%) with Japan, 4.12% (from 18.19% to 14.07%) with France, 0.81% (from 10.56% to 9.75%) with Germany, 0.81% (from 3.92% to 3.11%) with Italy, 0.68 (from 1.34% to 0.66%) with Mexico, 0.15% (from 0.78% to 0.63%) with South Africa and 0.15% (from 4.77% to 4.63%) with Canada (Table 26).

The largest impact (4.62) had been made by India's international collaborative papers with Belgium during 2006, followed by papers with Switzerland (3.86), Spain (3.52), Russia (3.50), Russia (4.01), Netherlands (3.42), Brazil (3.40), Thailand (3.17), France (2.96), Argentina (2.81), Poland (2.75), Denmark (2.67), Canada (2.64), Taiwan (2.62), Italy (2.61), South Africa (2.60), Germany (2.56), Australia (2.55), Sweden (2.53), United States (2.51), United Kingdom (2.51), Israel (2.34), Mexico (2.30), South Korea (2.29), China (2.14), Japan (1.88), Singapore (1.62) and Malaysia (1.16). The largest increase (1.39) in IF/Paper from 2001 to 2006 had been reported by Thailand, followed by Belgium (1.39), Russia (1.39), Spain (1.38), South Africa (1.36), Taiwan (1.32), Switzerland (1.23),

Canada (1.09), Denmark (1.05), Brazil (0.99), Sweden (0.97), Singapore (0.79), Poland (0.74), United Kingdom (0.71), Germany (0.70), Australia (0.61), USA (0.56), France (0.53), Italy (0.39), Netherlands (0.31), Japan (0.29) and Malaysia (0.18). In contrast, there was a maximum decrease (1.11) in value of impact factor per paper from 2001 to 2006 for Argentina, followed by South Korea (0.47) and China (0.09)(Table 27).

Table 23. Share and Impact of Indian Papers and Indian International Collaborative Papers

| Year | Total Indian Papers | Total International Collaborative Papers | Share of International Collaborative Papers In Indian research output | Average IF/Papers of total Indian papers | Average IF/Papers of total Indian international collaborative papers |
|------|---------------------|--|---|--|--|
| 2001 | 19479 | 3256 | 16.72 | 1.27 | 2.06 |
| 2006 | 3097 | 5899 | 19.05 | 1.63 | 2.23 |

Table 24. Distribution of India's International Collaborative Papers by Geographical Regions

| S.No. | Continents | TICP | | % ICP | |
|-------|--|------|-------|-------|-------|
| | | 2001 | 2006 | 2001 | 2006 |
| 1 | Africa | 172 | 235 | 3.97 | 2.28 |
| 2 | Asia | 1350 | 3202 | 31.13 | 31.08 |
| 3 | Europe | 1948 | 4329 | 44.92 | 42.02 |
| 4 | North America | 2626 | 5188 | 60.55 | 50.36 |
| 5 | Oceania | 144 | 458 | 3.32 | 4.45 |
| 6 | South America | 92 | 255 | 2.12 | 2.47 |
| | Total International Collaborative Papers | 4337 | 10302 | 100 | 100 |

Table 25. Distribution of International Collaborative Papers & Impact by Geographical Regions

| Broad Region | Total Papers | | Average IF/Paper | | |
|--|--------------|-------|------------------|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Africa | 172 | 235 | 1.19 | 2.46 | 1.27 |
| Asia | 1350 | 3202 | 1.50 | 1.73 | 0.23 |
| Europe | 1948 | 4329 | 1.94 | 2.34 | 0.40 |
| North America | 2626 | 5188 | 1.93 | 2.47 | 0.54 |
| Oceania | 144 | 458 | 1.82 | 2.47 | 0.65 |
| South America | 92 | 255 | 2.34 | 3.29 | 0.95 |
| Total International Collaborative Papers | 4337 | 10302 | 1.77 | 2.04 | 0.27 |

Table 26. Distribution of International Collaborative Papers by Major Countries

| S.No. | Collaborating Country | TICP | | % Share of TICP | | |
|-------|-----------------------|------|------|-----------------|-------|------------|
| | | 2001 | 2006 | 2001 | 2006 | Difference |
| 1 | USA | 2443 | 4820 | 56.33 | 46.79 | -9.54 |

| | | | | | | |
|----|--|------|-------|-------|-------|-------|
| 2 | Japan | 836 | 1468 | 19.28 | 14.25 | -5.03 |
| 3 | France | 789 | 1450 | 18.19 | 14.07 | -4.12 |
| 4 | UK | 379 | 1108 | 8.74 | 10.76 | 2.02 |
| 5 | Germany | 458 | 1004 | 10.56 | 9.75 | -0.81 |
| 6 | Canada | 207 | 476 | 4.77 | 4.62 | -0.15 |
| 7 | Australia | 131 | 410 | 3.02 | 3.98 | 0.96 |
| 8 | South Korea | 60 | 397 | 1.38 | 3.85 | 2.47 |
| 9 | China | 119 | 340 | 2.74 | 3.30 | 0.56 |
| 10 | Italy | 170 | 320 | 3.92 | 3.11 | -0.81 |
| 11 | Malaysia | 89 | 304 | 2.05 | 2.95 | 0.90 |
| 12 | Switzerland | 71 | 255 | 1.64 | 2.48 | 0.84 |
| 13 | Netherlands | 124 | 239 | 2.86 | 2.32 | -0.54 |
| 14 | Taiwan | 53 | 218 | 1.22 | 2.12 | 0.90 |
| 15 | Spain | 81 | 196 | 1.87 | 1.90 | 0.03 |
| 16 | Russia | 66 | 165 | 1.52 | 1.60 | 0.08 |
| 17 | Singapore | 37 | 164 | 0.85 | 1.59 | 0.74 |
| 18 | Sweden | 69 | 162 | 1.59 | 1.57 | -0.02 |
| 19 | Brazil | 56 | 161 | 1.29 | 1.56 | 0.27 |
| 20 | Belgium | 48 | 130 | 1.11 | 1.26 | 0.15 |
| 21 | Israel | 38 | 92 | 0.88 | 0.89 | 0.01 |
| 22 | Denmark | 35 | 84 | 0.81 | 0.81 | 0.0 |
| 23 | Poland | 44 | 83 | 1.01 | 0.81 | -0.2 |
| 24 | Thailand | 22 | 75 | 0.51 | 0.73 | 0.22 |
| 25 | Mexico | 58 | 68 | 1.34 | 0.66 | -0.68 |
| 26 | Argentina | 26 | 67 | 0.6 | 0.65 | 0.05 |
| 27 | South Africa | 34 | 65 | 0.78 | 0.63 | -0.15 |
| | Total International collaborative papers | 4337 | 10302 | | | |

Table 27. Distribution of International Collaborative Papers and Impact by Major Countries

| Collaborating country | International Collaborative Papers | | IF/Paper of International Collaborative Papers | | |
|-----------------------|------------------------------------|------|--|------|------------|
| | 2001 | 2006 | 2001 | 2006 | Difference |
| Belgium | 48 | 130 | 3.23 | 4.62 | 1.39 |
| Switzerland | 71 | 255 | 2.63 | 3.86 | 1.23 |
| Spain | 81 | 196 | 2.14 | 3.52 | 1.38 |
| Russia | 66 | 165 | 2.11 | 3.50 | 1.39 |
| Netherlands | 124 | 239 | 3.11 | 3.42 | 0.31 |
| Brazil | 56 | 161 | 2.41 | 3.40 | 0.99 |
| Thailand | 22 | 75 | 1.64 | 3.17 | 1.53 |
| France | 789 | 1450 | 2.43 | 2.96 | 0.53 |
| Argentina | 26 | 67 | 3.92 | 2.81 | -1.11 |
| Poland | 44 | 83 | 2.01 | 2.75 | 0.74 |
| Denmark | 35 | 84 | 1.62 | 2.67 | 1.05 |
| Canada | 207 | 476 | 1.55 | 2.64 | 1.09 |
| Taiwan | 53 | 218 | 1.3 | 2.62 | 1.32 |
| Italy | 170 | 320 | 2.22 | 2.61 | 0.39 |
| South Africa | 34 | 65 | 1.24 | 2.6 | 1.36 |
| Germany | 458 | 1004 | 1.86 | 2.56 | 0.70 |
| Australia | 131 | 410 | 1.94 | 2.55 | 0.61 |

| | | | | | |
|--|------|-------|------|------|-------|
| Sweden | 69 | 162 | 1.56 | 2.53 | 0.97 |
| USA | 2443 | 4820 | 1.95 | 2.51 | 0.56 |
| UK | 379 | 1108 | 1.80 | 2.51 | 0.71 |
| Israel | 38 | 92 | 2.35 | 2.34 | -0.01 |
| Mexico | 58 | 68 | 2.26 | 2.3 | 0.04 |
| South Korea | 60 | 397 | 2.76 | 2.29 | -0.47 |
| China | 119 | 340 | 2.23 | 2.14 | -0.09 |
| Japan | 836 | 1468 | 1.59 | 1.88 | 0.29 |
| Singapore | 37 | 164 | 0.83 | 1.62 | 0.79 |
| Malaysia | 89 | 304 | 0.98 | 1.16 | 0.18 |
| Total International collaborative papers | 4337 | 10302 | 1.77 | 2.04 | 0.27 |

5. India's Research Output by Geographical Regions

High Productivity States: Maharashtra, Tamil Nadu, Delhi, West Bengal, Karnataka, and Uttar Pradesh are the top 6 high productivity states in terms of publications output and share and their combined national publication share in India's total publication output has increased from 66.11% in 2001 to 71.01% in 2006. Individually, their publication's share ranged from 8.99% to 15.35% in India's total cumulative publication output. Among these six most productive states, the national publication share of Tamil Nadu had shown the largest increase of 2.77% (from 10.31% to 13.08%) from 2001 to 2006, followed by 2.03% (from 9.78% to 11.81%) in Karnataka, 1.45% (from 12.07% to 13.52%) in Delhi and 0.99% (from 9.61% to 10.60%) in West Bengal. In contrast, the national publication share has decreased by 3.55% (from 15.35% to 11.80%) in Maharashtra (Table 28).

Medium Productivity States: Andhra Pradesh, Kerala, Gujarat, Madhya Pradesh, Chandigarh, Uttarakhand, Punjab Rajasthan, Haryana, Assam and Orissa are the eleven medium productivity states and their combined national publication share in India's total publication output has increased from 28.33% in 2001 to 32.22% in 2006. Their individual publication's share ranged from 1.01% to 7.40% in India's total publications output. Except for Orissa and Chandigarh, the national publication share of all other medium productive states have increased from 2001 to 2006 by 0.95% in Panjab, 0.92% in Andhra Pradesh, 0.69% in Kerala, 0.36% in Assam, 0.35% in Gujarat, 0.32% in Uttaranchal, 0.28% in Haryana, 0.26% in Madhya Pradesh and 0.04% in Rajasthan (Table 28).

Low Productivity States: Jharkhand, Himachal Pradesh, Jammu & Kashmir, Goa, Pondicherry, Meghalaya, Chattisgarh, Bihar and Manipur are the nine low productivity states and their combined national publication share in India's total publication output has increased from 4.91% in 2001 and 5.43% in 2006. Their individual publication's share ranged from 0.11% to 1.18% in India's total research output. Except for Bihar, Meghalaya, Himachal Pradesh and Pondicherry, all other low productive states have increased their national publication share from 2001 to 2006 by 0.70% in Jharkhand, 0.27% in J&K, 0.23% in Goa, and 0.14% in Manipur (Table 28)

Least Productive States: Nagaland, Tripura., Andaman & Nicobar, Sikkim, Mizoram and Arunachal Pradesh are the seven least productive states and their combined national publication share in India's total publication output have increased from 0.36% in 2001 to 0.53% in 2006 (Table 28).

Table 28. Distribution of Indian Research Output by Geographical Regions

| Main Subjects | Number of Papers | | % Share | |
|-------------------|------------------|-------|---------|-------|
| | 2001 | 2006 | 2001 | 2006 |
| Maharashtra | 4112 | 5211 | 15.35 | 11.80 |
| Tamil Nadu | 2762 | 5775 | 10.31 | 13.08 |
| Delhi | 3234 | 5970 | 12.07 | 13.52 |
| West Bengal | 2574 | 4682 | 9.61 | 10.60 |
| Karnataka | 2620 | 5213 | 9.78 | 11.81 |
| Uttar Pradesh | 2410 | 4505 | 8.99 | 10.20 |
| Andhra Pradesh | 1735 | 3266 | 6.48 | 7.40 |
| Kerala | 825 | 1666 | 3.08 | 3.77 |
| Gujarat | 853 | 1557 | 3.18 | 3.53 |
| Madhya Pradesh | 628 | 1149 | 2.34 | 2.60 |
| Chandigarh | 750 | 1191 | 2.80 | 2.70 |
| Uttaranchal | 588 | 1108 | 2.19 | 2.51 |
| Punjab | 448 | 1156 | 1.67 | 2.62 |
| Rajasthan | 631 | 1055 | 2.35 | 2.39 |
| Haryana | 496 | 942 | 1.85 | 2.13 |
| Assam | 271 | 606 | 1.01 | 1.37 |
| Orissa | 369 | 532 | 1.38 | 1.20 |
| Jharkhand | 130 | 521 | 0.48 | 1.18 |
| Himachal Pradesh | 271 | 372 | 1.01 | 0.84 |
| J&K | 221 | 481 | 0.82 | 1.09 |
| Goa | 111 | 281 | 0.41 | 0.64 |
| Pondicherry | 199 | 323 | 0.74 | 0.73 |
| Meghalaya | 69 | 42 | 0.26 | 0.09 |
| Chhattisgarh | 59 | 150 | 0.22 | 0.34 |
| Bihar | 231 | 121 | 0.86 | 0.27 |
| Manipur | 29 | 112 | 0.11 | 0.25 |
| Nagaland | 16 | 46 | 0.06 | 0.10 |
| Tripura | 17 | 22 | 0.06 | 0.05 |
| Andaman & Nicobar | 15 | 23 | 0.06 | 0.05 |
| Sikkim | 6 | 41 | 0.02 | 0.09 |
| Mizoram | 7 | 66 | 0.026 | 0.15 |
| Arunachal Pradesh | 34 | 39 | 0.13 | 0.09 |
| Lakshadweep | 0 | 0 | 0 | 0 |
| Total | 26788 | 44150 | 100 | 100 |

6. High Productivity S&T Institutions in India

Based on publications output data for India in science and technology for 2006, a total of 15 institutions were identified as high productive ones publishing more than 300 papers in the country. Category wise these include:

Seven institutes of national importance (Indian Institute of Science, Bangalore (IISc-BANG), Indian Institute of Technology, Kharagpur (IIT-KHAR), All India Institute of Medical Science, New Delhi (AIIMS-DELH), Indian Institute of Technology, Delhi (IIT-DELH), Indian Institute of Technology,

Chennai (IIT-Chen), Indian Institute of Technology, Kanpur (IIT-Kanp) and Indian Institute of Technology, Mumbai (IIT-Mumb).

Four research institutes (Bhabha Atomic Research Institute, Mumbai (BARC-MUMB), Indian Institute of Chemical Technology, Hyderabad (IICT-HYDE), Tata Institute of Fundamental Research, Mumbai (TIFR-MUMB) and National Chemical Laboratory, Pune (NCL-PUNE).

Four universities (Jadavpur University, Kolkata (JADAUNIV), university of Delhi (DELHUNIV), Banaras Hindu University, Varanasi (BHUVARA) and Madras University, Chennai (MADRUNIV).

The total contribution of these 15 major institutions has increased from 6364 papers in 2001 to 11206 papers in 2006, and their national share increased from 23.76% in 2001 to 25.38% in 2006. The national output of these 15 institutions showed a growth rate of 76.08% from 2001 to 2006. Eight institutions showed growth rate higher than the average growth rate of 15 institutions from 2001 to 2006. These are: IIT-KHAR with a growth rate of 135.8%, followed by IIT-DELHI (134.4%), IIT-CHENN (118.4%), IIT-KANP (111.9%), IICT-HYDE (111.9%), JADAUNIV (103.6%), IIT-MUMB (99.29%) and Banaras Hindu University, Varanasi (91.02%)(Table 29).

The impact factor per paper of these 15 institutions had increased from 1.21 in 2001 to 1.47 in 2006. Of these 15 top institutions, 7 institutions showed impact factor per paper above 15-institutions impact factor average during 2006. These are: NCL-PUNE with 2.38 impact factor per paper, followed by TIFR-MUMB (2.10), IICT-HYDE (2.02), IISC-BANG (1.71), BARC-MUMB (1.71), BANAUNIV (1.51) and DELHUNIV (1.48). Except TIFR-MUMB, all other 14 top institutions showed increased in the average impact factor from 2001 to 2006. The largest increase in impact factor (0.72) was witnessed by BANAUNIV, followed by 0.53 by IIT-DELH, 0.53 BY AIIMS-DELH, 0.48 by DELHUNIV, 0.47 by NCL-PUNE, 0.44 by IIT-KHAR, 0.41 by BARC-MUMB, 0.31 by IICT-HYDE, 0.28 by IIT-CHEN, 0.25 by IIT-MUMB, 0.14 by IIT-KANP, 0.13 by JADAUNIV and 0.01 by IISC-BANG (Table 29).

Table 29. Publication Profile of Top 15 Most Productive Organizations in India

| Affiliation | Total Papers | | | % Share | | |
|--|--------------|------|--------|---------|------|------------|
| | 2001 | 2006 | Growth | 2001 | 2006 | Difference |
| Indian Institute of Science, Bangalore | 880 | 1462 | 66.14 | 1.70 | 1.71 | 0.01 |
| Indian Institute of Technology, Kharagpur | 467 | 1101 | 135.8 | 0.75 | 1.19 | 0.44 |
| Indian Institute of Technology, Delhi | 462 | 1083 | 134.4 | 0.74 | 1.27 | 0.53 |
| Bhabha Atomic Research Center, Mumbai | 580 | 924 | 59.31 | 1.20 | 1.61 | 0.41 |
| All India Institute of Medical Sciences, Delhi | 630 | 763 | 21.11 | 0.92 | 1.45 | 0.53 |
| Indian Institute of Technology, Chennai | 374 | 817 | 118.4 | 0.80 | 1.08 | 0.28 |
| Indian Institute of Technology, Mumbai | 420 | 837 | 99.29 | 1.02 | 1.27 | 0.25 |
| Indian Institute of Technology, Kanpur | 378 | 804 | 112.7 | 1.05 | 1.19 | 0.14 |
| University of Delhi, Delhi | 365 | 580 | 58.9 | 1.00 | 1.48 | 0.48 |
| Indian Institute of Chemical Technology, Hyderabad | 277 | 587 | 111.9 | 1.71 | 2.02 | 0.31 |
| Banaras Hindu University, Varanasi | 245 | 468 | 91.02 | 0.79 | 1.51 | 0.72 |

| | | | | | | |
|--|-----|-----|-------|------|------|-------|
| Jadavpur University, Kolkata | 309 | 629 | 103.6 | 1.04 | 1.17 | 0.13 |
| Tata Institute Of Fundamental Research, Mumbai | 407 | 460 | 13.02 | 2.11 | 2.10 | -0.01 |
| National Chemical Laboratory, Pune | 359 | 378 | 5.292 | 1.91 | 2.38 | 0.47 |
| University of Madras, Chennai | 211 | 313 | 48.34 | 0.93 | 1.34 | 0.41 |

Indian S&T Statistics from Scopus Database

Table 1. Growth and Impact of Indian Research Output during 2001 & 2006

| Publication Year | No. of Papers | Total Impact Factor | Average Impact Factor per paper |
|------------------|---------------|---------------------|---------------------------------|
| 2001 | 26788 | 26287.032 | 0.981299 |
| 2006 | 44150 | 56303.4864 | 1.275277 |

Table 2. Distribution of Indian Research Output by Impact Factor Range, 1996 to 2006

| IF Range | Number of papers | | Share of papers | |
|--------------|------------------|--------------|-----------------|--------------|
| | 2001 | 2006 | 2001 | 2006 |
| 0.0 – 0.0 | 8022 | 14550 | 29.95 | 32.96 |
| 0.1 – 0.99 | 10822 | 11852 | 40.40 | 26.84 |
| 1.0 – 1.99 | 3898 | 7891 | 14.55 | 17.87 |
| 2.0 – 2.99 | 2129 | 5329 | 7.95 | 12.07 |
| 3.0 – 3.99 | 786 | 2049 | 2.93 | 4.64 |
| 4.0 & > 4.0 | 1131 | 2479 | 4.22 | 5.61 |
| Total | 26788 | 44150 | 26788 | 44150 |

Table 3. Distribution of Papers by Broad Sectors, 2001 & 2006

| Sectors | 2001 | | | 2006 | | |
|----------------------------------|--------------|------------------|--------------------|--------------|-------------------|--------------------|
| | Papers | Total IF | Average IF/ Papers | Papers | Total IF | Average IF/ Papers |
| Academic | 11259 | 7767.926 | 0.69 | 21636 | 20111.42 | 0.93 |
| R&D | 8785 | 10010.56 | 1.14 | 12503 | 18396.66 | 1.47 |
| Institute of National Importance | 4231 | 4415.697 | 1.04 | 8537 | 11268.68 | 1.32 |
| Industry | 755 | 478.526 | 0.63 | 1856 | 1504.686 | 0.81 |
| Others | 2191 | 1681.574 | 0.77 | 4438 | 4337.839 | 0.98 |
| Total | 26788 | 26287.032 | 0.98 | 44150 | 56303.4864 | 1.28 |

Table 4. Distribution of Papers According to Institute Type (DST Classification)

| Sectors | 2001 | | | 2006 | | |
|----------------------------------|--------------|------------------|--------------------|--------------|-------------------|--------------------|
| | Papers | Total IF | Average IF/ Papers | Papers | Total IF | Average IF/ Papers |
| University/Colleges | 10785 | 7544.905 | 0.70 | 20240 | 19043.13 | 0.94 |
| Deemed Universities | 611 | 334.519 | 0.55 | 2015 | 1535.776 | 0.76 |
| Research Institutes | 8786 | 10011.19 | 1.14 | 12503 | 18396.66 | 1.47 |
| Institute of National Importance | 4231 | 4415.697 | 1.04 | 8537 | 11268.68 | 1.32 |
| Others | 2923 | 2133.966 | 0.73 | 6143 | 5724.576 | 0.93 |
| Total | 26788 | 26287.032 | 0.98 | 44150 | 56303.4864 | 1.28 |

Table 5. Academic Sector: Distribution of Papers by Type of Institutions

| Institute Type (Academic) | 2001 | | | 2006 | | |
|---------------------------|--------------|-----------------|-------------------|--------------|-----------------|-------------------|
| | Papers | Total IF | Average IF/ Paper | Papers | Total IF | Average IF/ Paper |
| University | 7230 | 5486.045 | 0.76 | 12542 | 13522.2 | 1.08 |
| Deemed University | 612 | 334.616 | 0.55 | 2015 | 1535.776 | 0.76 |
| Interuniversity | 96 | 218.97 | 2.28 | 397 | 577.255 | 1.45 |
| Colleges | 4085 | 2308.846 | 0.57 | 9550 | 7023.114 | 0.74 |
| Total | 11259 | 7767.926 | 0.69 | 21636 | 20111.42 | 0.93 |

Table 6. Academic Sector: Distribution of Papers by Type of Colleges

| Institute Type (Academic) | 2001 | | | 2006 | | |
|------------------------------|--------|----------|----------------------|--------|----------|----------------------|
| | Papers | Total IF | Average IF/ Paper | Papers | Total IF | Average IF/ Paper |
| College-Medicine | 1420 | 899.345 | 0.63 | 3325 | 2681.033 | 0.81 |
| College-(General) | 1300 | 833.484 | 0.64 | 2774 | 2363.304 | 0.85 |
| College-Engineering | 634 | 314.107 | 0.50 | 2383 | 1485.309 | 0.62 |
| College-Veterinary | 379 | 94.202 | 0.25 | 543 | 221.41 | 0.41 |
| College-Pharmacy | 170 | 110.025 | 0.65 | 545 | 353.372 | 0.65 |
| College-Agricultural | 131 | 23.595 | 0.18 | 103 | 47.717 | 0.46 |
| College-Dental | 44 | 30.531 | 0.69 | 191 | 68.128 | 0.36 |
| College-Fisheries | 23 | 23.613 | 1.03 | 21 | 11.992 | 0.57 |
| Total | 4085 | 2308.846 | 0.57 | 9550 | 7023.114 | 0.74 |

Table 7. R&D Sector: Distribution of papers by Major Funding Agencies

| Agency/ Department | 2001 | | | 2006 | | |
|-----------------------|-----------------|----------|---------------------|-----------------|----------|---------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| CSIR | 2322 | 2926.932 | 1.26 | 3539 | 5698.875 | 1.61 |
| DAE | 1747 | 2956.057 | 1.69 | 2534 | 4660.062 | 1.84 |
| DBT | 143 | 212.899 | 1.49 | 207 | 519.538 | 2.51 |
| DOE | 6 | 3.838 | 0.64 | 15 | 17.006 | 1.13 |
| DOS | 295 | 458.873 | 1.56 | 543 | 579.646 | 1.07 |
| DRDO | 306 | 223.375 | 0.73 | 563 | 600.738 | 1.07 |
| DST | 899 | 1595.947 | 1.78 | 1118 | 2593.467 | 2.32 |
| ICAR | 928 | 435.442 | 0.47 | 1430 | 1308.834 | 0.92 |
| ICMR | 326 | 319.668 | 0.98 | 485 | 666.679 | 1.37 |
| MHFW | 764 | 667.126 | 0.87 | 879 | 1182.372 | 1.35 |
| MHRD | 62 | 21.402 | 0.35 | 127 | 98.968 | 0.78 |
| MNCES | 2 | 0.476 | 0.24 | 7 | 12.581 | 1.80 |
| MOC-DOC | 21 | 12.469 | 0.59 | 32 | 38.448 | 1.20 |
| MOCF-DCP | 17 | 29.048 | 1.71 | 123 | 249.219 | 2.03 |
| MOD | 21 | 20.306 | 0.97 | 13 | 4.33 | 0.33 |
| MOEN | 217 | 86.799 | 0.40 | 136 | 93.825 | 0.69 |
| MOER | 15 | 11.989 | 0.80 | 81 | 102.441 | 1.26 |
| MOHA | 14 | 11.572 | 0.83 | 41 | 46.232 | 1.13 |
| MOIT | 33 | 14.838 | 0.45 | 44 | 46.381 | 1.05 |
| MOM | 83 | 41.988 | 0.51 | 127 | 128.412 | 1.01 |
| MOP | 16 | 6.509 | 0.41 | 17 | 13.716 | 0.81 |
| MOTX | 107 | 27.799 | 0.26 | 129 | 31.863 | 0.25 |
| MOWR | 40 | 17.33 | 0.43 | 99 | 89.233 | 0.90 |
| PUB | 222 | 132.257 | 0.60 | 267 | 337.902 | 1.27 |
| STATE | 465 | 228.978 | 0.49 | 607 | 553.073 | 0.91 |
| Total R&D | 8785 | 10010.56 | 1.14 | 12503 | 18396.66 | 1.47 |

CSIR=Council of Scientific & Industrial Research; DAE=Department of Atomic Energy; DBT=Department of Biotechnology; DOE=Department of Electronics; DOS=Department of Space; DRDO=Defense Research & Development Organization; DST=Department of Science & Technology; ICAR=Indian Council of Agricultural Research; ICMR=Indian Council of Medical Research; MHFW=Ministry of Health & Family Welfare; MHRD=Ministry of Human Resource Development; MNCES=Ministry of Non-Conventional Energy Resources; MOC-DOC=Ministry of Commerce-Department of Commerce; MOCF-DCP=Ministry of Chemicals & Fertilizers-Department of Chemicals & Petrochemicals; MOD=Ministry of Defense; MOEN=Ministry of Environment & Forests; MOER=Ministry of Earth Resources; MOHA=Ministry of Home Affairs; MOIT=Ministry of Information Technology & Communications; MOM=Ministry of Mines; MOP=Ministry of Mines; MOP=Ministry of Power; MOTX=Ministry of Textiles; MOWR=Ministry of Water Resources; PUB=Public Funding (Hospitals); state: State funding

Table 8. Industry Sector: Distribution of Papers by Type of Funding

| Funding Type | 2001 | | | 2006 | | |
|------------------|-----------------|----------|-----------------|----------|-----------------|----------|
| | Total Papers | Total IF | Total Papers | Total IF | Total Papers | Total IF |
| Public Industry | 27 | 9.09 | 0.34 | 214 | 118.178 | 0.55 |
| Private Industry | 729 | 469.436 | 0.64 | 1659 | 1391.561 | 0.84 |
| Total Industry | 755 | 478.526 | 0.63 | 1856 | 1504.686 | 0.81 |

Table 9. Others Sector: Distribution of Papers by Type of Institutions

| Type of Institutions | 2001 | | | 2006 | | |
|-----------------------|--------------|----------|--------------------|--------------|----------|--------------------|
| | Total Papers | Total IF | Average IF / Paper | Total Papers | Total IF | Average IF / Paper |
| Academies | 16 | 5.301 | 0.33 | 99 | 151.13 | 1.53 |
| Associations | 9 | 8.332 | 0.93 | 283 | 188.469 | 0.67 |
| Councils | 4 | 2.971 | 0.74 | 1 | 0 | 0.00 |
| Foundations | 169 | 151.777 | 0.90 | 311 | 341.347 | 1.10 |
| Hospitals | 831 | 645.194 | 0.78 | 1801 | 1876.573 | 1.04 |
| Individuals | 845 | 571.308 | 0.68 | 1479 | 1052.741 | 0.71 |
| Organizations | 17 | 22.135 | 1.30 | 133 | 203.31 | 1.53 |
| Research Institutions | 280 | 264.836 | 0.95 | 416 | 565.157 | 1.36 |
| Societies | 82 | 71.027 | 0.87 | 217 | 199.777 | 0.92 |
| Trusts | 32 | 22.644 | 0.71 | 82 | 114.339 | 1.39 |
| Total Others sector | 2191 | 1681.574 | 0.77 | 4438 | 4337.839 | 0.98 |

Table 10. Others Sector: Distribution of Papers by Type of Funding

| Type of Funding | 2001 | | | 2006 | | |
|---------------------|--------------|----------|--------------------|--------------|----------|--------------------|
| | Total Papers | Total IF | Average IF / Paper | Total Papers | Total IF | Average IF / Paper |
| International | 119 | 138.586 | 1.16 | 253 | 404.548 | 1.60 |
| Nonprofit | 472 | 408.755 | 0.87 | 1110 | 1145.81 | 1.03 |
| Private | 1634 | 1158.63 | 0.71 | 3223 | 2947.62 | 0.91 |
| Total Others Sector | 2191 | 1681.574 | 0.77 | 4438 | 4337.839 | 0.98 |

Table 11. Distribution of Papers by Funding Agency during 2001 & 2006

| Funding Agencies | 2001 | | | 2006 | | |
|------------------|--------|-----------|----------|----------|------------|----------|
| | Papers | Total IF | Papers | Total IF | Papers | Total IF |
| CSIR | 2321 | 2923.888 | 1.26 | 3539 | 5698.875 | 1.61 |
| DAE | 1747 | 2956.057 | 1.69 | 2534 | 4660.062 | 1.84 |
| DBT | 143 | 212.899 | 1.49 | 207 | 519.538 | 2.51 |
| DOE | 6 | 3.838 | 0.64 | 15 | 17.006 | 1.13 |
| DOS | 295 | 458.873 | 1.56 | 543 | 579.646 | 1.07 |
| DRDO | 306 | 223.375 | 0.73 | 563 | 600.738 | 1.07 |
| DST | 974 | 1683.242 | 1.73 | 1264 | 2781.828 | 2.20 |
| ICAR | 928 | 435.442 | 0.47 | 1431 | 1311.216 | 0.92 |
| ICMR | 327 | 320.423 | 0.98 | 485 | 666.679 | 1.37 |
| MOHA | 14 | 11.572 | 0.83 | 41 | 46.232 | 1.13 |
| MHFW | 1463 | 1287.84 | 0.88 | 2226 | 3140.343 | 1.41 |
| MHRD | 3844 | 3853.637 | 1.00 | 8554 | 10022.815 | 1.17 |
| MOD | 21 | 20.306 | 0.97 | 13 | 4.33 | 0.33 |
| MOCF-DCP | 14 | 11.47 | 0.82 | 123 | 249.219 | 2.03 |
| MNCES | 2 | 0.476 | 0.24 | 7 | 12.581 | 1.80 |
| MOEF | 217 | 86.799 | 0.4 | 136 | 93.825 | 0.69 |
| MOER | 15 | 11.989 | 0.8 | 81 | 102.441 | 1.26 |
| MOIT | 33 | 14.838 | 0.45 | 44 | 46.381 | 1.05 |
| MOM | 83 | 41.988 | 0.51 | 127 | 128.412 | 1.01 |
| MOTX | 107 | 27.799 | 0.26 | 129 | 31.863 | 0.25 |
| MWR | 40 | 17.33 | 0.43 | 99 | 89.233 | 0.90 |
| Total | 26788 | 26287.032 | 0.981299 | 44150 | 56303.4864 | 1.275277 |

CSIR=Council of Scientific & Industrial Research; DAE=Department of Atomic Energy; DBT=Department of Biotechnology; DOE=Department of Electronics; DOS=Department of Space; DRDO=Defense Research & Development Organization; DST=Department of Science & Technology; ICAR=Indian Council of Agricultural Research; ICMR=Indian Council of Medical Research; MHFW=Ministry of Health & Family Welfare; MHRD=Ministry of Human Resource Development; MNCES=Ministry of Non-Conventional Energy Resources; MOCF-DCP=Ministry of Chemicals & Fertilizers-Department of Chemicals & Petrochemicals; MOD=Ministry of Defense; MOEF=Ministry of Environment & Forests; MOER=Ministry of Earth Resources; MOHA=Ministry of Home Affairs; MOIT=Ministry of Information Technology & Communications; MOM: Ministry of Mines; MOP: Ministry of Mines; MOP: Ministry of Power; MOTX=Ministry of Textiles; MWR: Ministry of Water Resources

Table 12. Distribution of Papers by Broad Geographical Areas

| Geographical Areas | 2001 | | | 2006 | | |
|--------------------|--------------|-----------|--------------------|--------------|-----------|--------------------|
| | Total Papers | Total IF | Average IF / Paper | Total Papers | Total IF | Average IF / Paper |
| Andaman & Nicobar | 15 | 7.026 | 0.47 | 23 | 20.226 | 0.88 |
| Andhra Pradesh | 1735 | 1699.4 | 0.98 | 3266 | 4178.92 | 1.28 |
| Arunachal Pradesh | 34 | 19.564 | 0.58 | 39 | 27.42 | 0.70 |
| Assam | 271 | 179.517 | 0.66 | 606 | 603.603 | 1.00 |
| Bihar | 231 | 75.639 | 0.33 | 121 | 79.843 | 0.66 |
| Chandigarh | 750 | 714.111 | 0.95 | 1191 | 1733.687 | 1.46 |
| Chhattisgarh | 59 | 24.083 | 0.41 | 150 | 110.792 | 0.74 |
| Delhi | 3234 | 2672.476 | 0.83 | 5970 | 7524.763 | 1.26 |
| Goa | 111 | 109.573 | 0.99 | 281 | 385.555 | 1.37 |
| Gujarat | 853 | 725.496 | 0.85 | 1557 | 1732.362 | 1.11 |
| Haryana | 496 | 212.537 | 0.43 | 942 | 762.404 | 0.81 |
| Himachal Pradesh | 271 | 94.59 | 0.35 | 372 | 283.232 | 0.76 |
| J&K | 221 | 103.876 | 0.47 | 481 | 346.481 | 0.72 |
| Jharkhand | 130 | 53.547 | 0.41 | 521 | 337.524 | 0.65 |
| Karnataka | 2620 | 3229.964 | 1.23 | 5213 | 6271.13 | 1.20 |
| Kerala | 825 | 683.942 | 0.83 | 1666 | 1920.922 | 1.15 |
| Lakshadweep | | | | | | |
| Madhya Pradesh | 628 | 365.927 | 0.58 | 1149 | 1173.958 | 1.02 |
| Maharashtra | 4112 | 4513.093 | 1.10 | 5211 | 6344.8 | 1.22 |
| Manipur | 29 | 8.403 | 0.29 | 112 | 23.216 | 0.21 |
| Meghalaya | 69 | 66.432 | 0.96 | 42 | 36.605 | 0.87 |
| Mizoram | 7 | 0.553 | 0.08 | 66 | 86.946 | 1.32 |
| Nagaland | 16 | 4.367 | 0.27 | 46 | 47.271 | 1.03 |
| Orissa | 369 | 343.601 | 0.93 | 532 | 603.231 | 1.13 |
| Pondicherry | 199 | 115.307 | 0.58 | 323 | 354.918 | 1.10 |
| Punjab | 448 | 295.956 | 0.66 | 1156 | 1016.897 | 0.88 |
| Rajasthan | 631 | 305.294 | 0.48 | 1055 | 673.691 | 0.64 |
| Sikkim | 6 | 4.501 | 0.75 | 41 | 21.008 | 0.51 |
| Tamil Nadu | 2762 | 2436.094 | 0.88 | 5775 | 5793.787 | 1.00 |
| Tripura | 17 | 13.265 | 0.78 | 22 | 37.05 | 1.68 |
| Uttaranchal | 588 | 326.551 | 0.56 | 1108 | 1118.471 | 1.01 |
| Uttar Pradesh | 2410 | 1853.833 | 0.77 | 4505 | 5348.211 | 1.19 |
| West Bengal | 2574 | 2616.116 | 1.02 | 4682 | 6235.436 | 1.33 |
| Total | 26788 | 26287.032 | 0.98 | 44150 | 56303.486 | 1.28 |

Table 13. Share and Impact of Indian Papers and Indian International Collaborative Papers

| Year | Total Indian Papers | Total International Collaborative Papers | Share of International Collaborative Papers In Indian research output | Total IF of Indian papers | Total IF of Indian international collaborative papers | Average IF/Papers of total Indian papers | Average IF/Papers of total Indian international collaborative papers |
|------|---------------------|--|---|---------------------------|---|--|--|
| 2001 | 26788 | 4337 | 16.19009 | 26287 | 7669.029 | 0.9813 | 1.77 |
| 2006 | 44150 | 10302 | 23.33409 | 56303.5 | 20964.61 | 1.27528 | 2.04 |

Table 14. Distribution of Indian International Collaborative Papers by Broad Geographical Continent

| Continent | 2001 | | | 2006 | | |
|--|--------------|----------|-------------------|--------------|----------|-------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| Africa | 172 | 204.383 | 1.19 | 235 | 578.654 | 2.46 |
| Asia | 1350 | 2027.7 | 1.50 | 3202 | 5553.837 | 1.73 |
| Europe | 1986 | 3849.004 | 1.94 | 4329 | 10141.37 | 2.34 |
| North America | 2626 | 5055.881 | 1.93 | 5188 | 12837.26 | 2.47 |
| Oceania | 144 | 261.867 | 1.82 | 458 | 1129.362 | 2.47 |
| South America | 92 | 214.939 | 2.34 | 255 | 839.647 | 3.29 |
| Total International Collaborative Papers | 4337 | 7669.029 | 1.77 | 10302 | 20964.61 | 2.04 |

Table 15. Distribution of Indian International Collaborative Papers by Broad Geographical Continent/Regions

| Region | 2001 | | | 2006 | | |
|--|--------------|-----------------|----------------------|-----------------|-----------------|----------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| Asia | 1350 | 2027.7 | 1.50 | 3202 | 5553.837 | 1.73 |
| Central Asia | 8 | 10.692 | 1.34 | 10 | 22.436 | 2.24 |
| South Asia | 70 | 69.436 | 0.99 | 196 | 391.461 | 2.00 |
| South East Asia | 189 | 201.873 | 1.07 | 367 | 579.071 | 1.58 |
| East Asia | 1004 | 1659.178 | 1.65 | 196 | 391.461 | 2.00 |
| Middle East Asia | 134 | 208.755 | 1.56 | 587 | 937.58 | 1.60 |
| Europe | 1986 | 3849.004 | 1.94 | 4329 | 10141.37 | 2.34 |
| Central Europe | 596 | 1127.183 | 1.89 | 1407 | 3728.872 | 2.65 |
| East Europe | 79 | 171.18 | 2.17 | 193 | 628.075 | 3.25 |
| North Europe | 489 | 876.681 | 1.79 | 1410 | 3396.753 | 2.41 |
| South Europe | 267 | 569.196 | 2.13 | 606 | 1617.47 | 2.67 |
| West Europe | 903 | 2127.762 | 2.36 | 1705 | 4885.993 | 2.87 |
| Africa | 172 | 204.383 | 1.19 | 235 | 578.654 | 2.46 |
| East Africa | 34 | 40.111 | 1.18 | 67 | 166.244 | 2.48 |
| Middle Africa | 0 | 0 | 0 | 9 | 78.208 | 8.69 |
| North Africa | 83 | 86.835 | 1.05 | 69 | 146.287 | 2.12 |
| South Africa | 35 | 45.112 | 1.29 | 73 | 178.025 | 2.44 |
| West Africa | 23 | 33.806 | 1.47 | 38 | 107.011 | 2.82 |
| North America | 2626 | 5055.881 | 1.93 | 5188 | 12837.26 | 2.47 |
| South America | 92 | 214.939 | 2.34 | 255 | 839.647 | 3.29 |
| Oceania | 144 | 261.867 | 1.82 | 458 | 1129.362 | 2.47 |
| Total International Collaborative Papers | 4337 | 7669.029 | 1.77 | 10302 | 20964.61 | 2.04 |

Table 16. Distribution of International Collaborative Papers by Major Countries

| Country | 2001 | | | 2006 | | |
|-------------|--------------|----------|----------------------|-----------------|----------|----------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| USA | 2443 | 4773.075 | 1.95 | 4820 | 12091.5 | 2.51 |
| Germany | 458 | 849.831 | 1.86 | 1004 | 2568.253 | 2.56 |
| UK | 379 | 682.174 | 1.80 | 1108 | 2785.528 | 2.51 |
| Japan | 836 | 1332.653 | 1.59 | 1468 | 2759.418 | 1.88 |
| France | 789 | 1917.955 | 2.43 | 1450 | 4285.302 | 2.96 |
| South Korea | 60 | 165.655 | 2.76 | 397 | 910.842 | 2.29 |
| Canada | 207 | 319.891 | 1.55 | 476 | 1258.715 | 2.64 |
| China | 119 | 265.714 | 2.23 | 340 | 726.514 | 2.14 |
| Italy | 170 | 377.494 | 2.22 | 320 | 835.392 | 2.61 |
| Australia | 131 | 253.785 | 1.94 | 410 | 1044.071 | 2.55 |
| Switzerland | 71 | 186.511 | 2.63 | 255 | 984.74 | 3.86 |
| Taiwan | 53 | 69.101 | 1.30 | 218 | 571.343 | 2.62 |
| Spain | 81 | 173.485 | 2.14 | 196 | 690.292 | 3.52 |
| Russia | 66 | 139.492 | 2.11 | 165 | 576.708 | 3.50 |
| Malaysia | 89 | 87.355 | 0.98 | 304 | 352.347 | 1.16 |
| Brazil | 56 | 134.987 | 2.41 | 161 | 547.115 | 3.40 |
| Netherlands | 124 | 385.945 | 3.11 | 239 | 818.126 | 3.42 |
| Singapore | 37 | 30.78 | 0.83 | 164 | 265.783 | 1.62 |
| Sweden | 69 | 107.598 | 1.56 | 162 | 409.275 | 2.53 |
| Belgium | 48 | 154.843 | 3.23 | 130 | 600.72 | 4.62 |
| Israel | 38 | 89.468 | 2.35 | 92 | 214.838 | 2.34 |
| Denmark | 35 | 56.574 | 1.62 | 84 | 224.654 | 2.67 |

| | | | | | | |
|--|------|----------|------|-------|----------|------|
| Poland | 44 | 88.263 | 2.01 | 83 | 228.525 | 2.75 |
| Argentina | 26 | 101.97 | 3.92 | 67 | 188.299 | 2.81 |
| Mexico | 58 | 130.82 | 2.26 | 68 | 156.323 | 2.30 |
| Thailand | 22 | 36.144 | 1.64 | 75 | 237.883 | 3.17 |
| South Africa | 34 | 42.175 | 1.24 | 65 | 169.101 | 2.60 |
| Total International Collaborative papers | 4337 | 7669.029 | 1.77 | 10302 | 20964.61 | 2.04 |

Table 17. Distribution of Papers and Impact by Broad Main Subjects, 2001 & 2006

| Main Subjects | 2001 | | | 2006 | | |
|----------------------|--------|-----------|-------------------|--------|-----------|-------------------|
| | Papers | Total IF | Average IF/Papers | Papers | Total IF | Average IF/Papers |
| Life Sciences | 7092 | 8041.998 | 1.13 | 11779 | 17402.978 | 1.48 |
| Physical Sciences | 8814 | 10589.35 | 1.20 | 13602 | 20114.424 | 1.48 |
| Engineering Sciences | 5637 | 3080.989 | 0.55 | 10722 | 7606.555 | 0.71 |
| Health Sciences | 5354 | 4656.17 | 0.87 | 9562 | 13014.638 | 1.36 |
| Multidisciplinary | 57 | 376.98 | 6.61 | 102 | 7.305 | 0.07 |
| Total | 26788 | 26287.032 | 0.98 | 44150 | 56303.486 | 1.28 |

Table 18. Distribution of Papers by Broad Subjects (DST Classification)

| Subjects | 2001 | | | 2006 | | |
|--------------------------------|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/paper | Total Papers | Total IF | Average IF/paper |
| Agricultural Sciences | 5647 | 5916.289 | 1.05 | 9113 | 12701.69 | 1.39 |
| Chemical Sciences | 3875 | 4536.417 | 1.17 | 6081 | 9926.464 | 1.63 |
| Earth & Environmental Sciences | 1204 | 321.766 | 0.27 | 1815 | 1132.604 | 0.62 |
| Engineering & Technology | 5642 | 3150.976 | 0.56 | 10722 | 7606.555 | 0.71 |
| Mathematics | 864 | 1005.117 | 1.16 | 1341 | 1410.818 | 1.05 |
| Medical Sciences | 5378 | 4665.74 | 0.87 | 9562 | 13014.64 | 1.36 |
| Physical Sciences (Physics) | 3058 | 4784.919 | 1.56 | 4661 | 7910.795 | 1.70 |
| Total | 26788 | 26287.03 | 0.98 | 44150 | 56303.49 | 1.28 |

Table 19. Distribution of Papers by Life Sciences

| Subjects | 2001 | | | 2006 | | |
|--|--------------|----------|------------------|--------------|-----------|------------------|
| | Total Papers | Total IF | Average IF/paper | Total Papers | Total IF | Average IF/paper |
| Agricultural & Biological Sciences | 3187 | 1418.402 | 0.45 | 4369 | 3625.058 | 0.83 |
| Biochemistry, genetics & molecular biology | 2467 | 4535.111 | 1.84 | 4772 | 9180.616 | 1.92 |
| Pharmacology, Toxicology and Pharmaceutics | 617 | 476.434 | 0.77 | 1527 | 1557.548 | 1.02 |
| Immunology and Microbiology | 513 | 1066.083 | 2.08 | 1075 | 2281.206 | 2.12 |
| Neuroscience | 342 | 651.506 | 1.90 | 560 | 1318.425 | 2.35 |
| Total | 7092 | 8041.998 | 1.13 | 11779 | 17402.978 | 1.48 |

Table 20. Distribution of Papers by Physical Sciences

| Subjects | 2001 | | | 2006 | | |
|------------------------------|--------------|----------|------------------|--------------|-----------|------------------|
| | Total Papers | Total IF | Average IF/paper | Total Papers | Total IF | Average IF/paper |
| Physics and Astronomy | 1698 | 3359.475 | 1.98 | 2826 | 5403.482 | 1.91 |
| Chemistry | 3875 | 4536.417 | 1.17 | 6081 | 9926.464 | 1.63 |
| Mathematics | 832 | 1003.593 | 1.21 | 1341 | 1410.818 | 1.05 |
| Earth and Planetary Sciences | 1352 | 1416.518 | 1.05 | 1842 | 2518.876 | 1.37 |
| Environmental Science | 1192 | 316.463 | 0.27 | 1815 | 1132.604 | 0.62 |
| Total | 8814 | 10589.35 | 1.20 | 13602 | 20114.424 | 1.48 |

Table 21. Distribution of Papers by Engineering Sciences

| Subjects | 2001 | | | 2006 | | |
|----------------------|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/paper | Total Papers | Total IF | Average IF/paper |
| Engineering | 2168 | 547.423 | 0.25 | 4781 | 1765.114 | 0.37 |
| Computer Science | 589 | 300.871 | 0.51 | 1754 | 742.833 | 0.42 |
| Material Sciences | 1761 | 1541.64 | 0.88 | 2963 | 3187.464 | 1.08 |
| Chemical Engineering | 1038 | 651.397 | 0.63 | 1591 | 1967.435 | 1.24 |
| Energy | 95 | 42.693 | 0.45 | 351 | 202.773 | 0.58 |
| Total | 5637 | 3080.989 | 0.55 | 10722 | 7606.555 | 0.71 |

Table 22. Distribution of Papers by Health Sciences

| Subjects | 2001 | | | 2006 | | |
|--------------------|--------------|----------|------------------|--------------|-----------|------------------|
| | Total Papers | Total IF | Average IF/paper | Total Papers | Total IF | Average IF/paper |
| Medicine | 4728 | 4357.976 | 0.92 | 8759 | 12547.34 | 1.43 |
| Veterinary | 380 | 44.101 | 0.12 | 424 | 63.883 | 0.15 |
| Health Professions | 251 | 201.514 | 0.80 | 344 | 448.707 | 1.30 |
| Nursing | 67 | 119.805 | 1.79 | 70 | 90.191 | 1.29 |
| Dentistry | 52 | 19.199 | 0.37 | 102 | 60.135 | 0.59 |
| Total | 5354 | 4656.17 | 0.87 | 9562 | 13014.638 | 1.36 |

Table 23. Contribution of Top 15 Organizations in India

| Institute Name | 2001 | | | 2006 | | |
|--|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Indian Institute of Science, Bangalore | 880 | 1497.721 | 1.70 | 1462 | 2494.628 | 1.71 |
| Indian Institute of Technology, Kharagpur | 467 | 351.328 | 0.75 | 1101 | 1308.22 | 1.19 |
| Indian Institute of Technology, Delhi | 462 | 342.943 | 0.74 | 1083 | 1373.83 | 1.27 |
| Bhabha Atomic Research Center, Mumbai | 580 | 697.877 | 1.20 | 924 | 1492.028 | 1.61 |
| All India Institute of Medical Sciences, Delhi | 630 | 582.307 | 0.92 | 763 | 1103.358 | 1.45 |
| Indian Institute of Technology, Chennai | 374 | 299.401 | 0.80 | 817 | 878.398 | 1.08 |
| Indian Institute of Technology, Mumbai | 420 | 429.934 | 1.02 | 837 | 1064.452 | 1.27 |
| Indian Institute of Technology, Kanpur | 378 | 395.753 | 1.05 | 804 | 957.936 | 1.19 |
| University Of Delhi, Delhi | 365 | 363.387 | 1.00 | 580 | 857.345 | 1.48 |
| Indian Institute of Chemical Technology, Hyderabad | 277 | 473.798 | 1.71 | 587 | 1184.133 | 2.02 |
| Banaras Hindu University, Varanasi | 245 | 193.924 | 0.79 | 468 | 708.635 | 1.51 |
| Jadavpur University, Kolkata | 309 | 322.013 | 1.04 | 629 | 734.786 | 1.17 |
| Tata Institute Of Fundamental | 407 | 859.381 | 2.11 | 460 | 968.018 | 2.10 |

| | | | | | | |
|------------------------------------|-----|---------|------|-----|---------|------|
| Research, Mumbai | | | | | | |
| National Chemical Laboratory, Pune | 359 | 687.019 | 1.91 | 78 | 185.844 | 2.38 |
| University of Madras, Chennai | 211 | 197.044 | 0.93 | 313 | 420.226 | 1.34 |

Indian S&T Statistics from Web of Science Database

4. Statistics on Indian Publications Output in S&T during 2001 & 2006 using Web of Science database

Table 1. Growth and Impact of Indian Research Output during 2001 & 2006

| Publication Year | No. Of Papers | Total Impact Factor | Average Impact Factor per paper |
|------------------|---------------|---------------------|---------------------------------|
| 2001 | 19479 | 24756.1 | 1.27 |
| 2006 | 30970 | 50613.04 | 1.63 |

Table 2. Distribution of Indian Research Output by Impact Factor Range, 2001 & 2006

| IF Range | Number of Papers | | Share of Papers | |
|---------------------|------------------|--------------|-----------------|--------------|
| | 2001 | 2006 | 2001 | 2006 |
| 0.0 – 0.0 | 561 | 2441 | 2.88 | 7.88 |
| 0.1 – 0.99 | 11609 | 11511 | 59.60 | 37.17 |
| 1.0 – 1.99 | 3653 | 7854 | 18.75 | 25.36 |
| 2.0 – 2.99 | 1931 | 5283 | 9.91 | 17.06 |
| 3.0 – 3.99 | 713 | 1930 | 3.66 | 6.23 |
| 4.0 & > 4.0 | 1012 | 1951 | 5.20 | 6.30 |
| Total Papers | 19479 | 30970 | 19479 | 30970 |

Table 3. Distribution of Papers by Broad Sectors, 2001 & 2006

| Sectors | 2001 | | | 2006 | | |
|----------------------------------|--------------|----------------|-------------------|--------------|-----------------|-------------------|
| | Papers | Total IF | Average IF/ Paper | Papers | Total IF | Average IF/ Paper |
| Academic | 9074 | 8801.545 | 0.97 | 15149 | 20419.63 | 1.35 |
| R&D | 7166 | 11228.94 | 1.57 | 10609 | 20489.26 | 1.93 |
| Institute of National Importance | 3923 | 5578.018 | 1.42 | 6997 | 11897.73 | 1.70 |
| Industry | 451 | 529.888 | 1.17 | 1039 | 1468.214 | 1.41 |
| Others | 1030 | 1954.085 | 1.90 | 1832 | 4246.782 | 2.32 |
| Total | 19479 | 24756.1 | 1.27 | 30970 | 50613.04 | 1.63 |

Table 4. Distribution of Papers According to Institute Type (DST Classification)

| Institute Types | 2001 | | | 2006 | | |
|----------------------------------|--------------|----------------|------------------|--------------|-----------------|------------------|
| | Total Papers | Total IF | Average IF/paper | Total Papers | Total IF | Average IF/paper |
| University/Colleges | 8701 | 8511.535 | 0.98 | 14202 | 19437.93 | 1.37 |
| Deemed Universities | 498 | 396.285 | 0.80 | 1341 | 1456.481 | 1.09 |
| Research Institutes | 7170 | 11240.55 | 1.57 | 10609 | 20489.26 | 1.93 |
| Institute of National Importance | 3923 | 5578.018 | 1.42 | 6997 | 11897.73 | 1.70 |
| Others | 1467 | 2452.613 | 1.67 | 2840 | 5652.885 | 1.99 |
| Total | 19479 | 24756.1 | 1.27 | 30970 | 50613.04 | 1.63 |

Table 5. Academic Sector: Distribution of Papers by Type of Institutions

| Institute Type (Academic) | 2001 | | | 2006 | | |
|---------------------------|-------------|-----------------|-------------------|--------------|-----------------|-------------------|
| | Papers | Total IF | Average IF/ Paper | Papers | Total IF | Average IF/ Paper |
| University | 6130 | 6039.942 | 0.99 | 9792 | 13545.61 | 1.38 |
| Deemed University | 498 | 396.285 | 0.80 | 1341 | 1456.481 | 1.09 |
| Interuniversity | 183 | 342.832 | 1.87 | 343 | 694.277 | 2.02 |
| Colleges | 2929 | 2599.259 | 0.89 | 5487 | 6929.385 | 1.26 |
| Total | 9074 | 8801.545 | 0.97 | 15149 | 20419.63 | 1.35 |

Table 6. R&D Sector: Distribution of papers by Major Funding Agencies

| Agency/ Department | 2001 | | | 2006 | | |
|-----------------------|-----------------|----------|---------------------|-----------------|----------|---------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| CSIR | 2227 | 3147.469 | 1.41 | 3599 | 7254.706 | 2.02 |
| DAE | 1743 | 3557.92 | 2.04 | 2222 | 4732.744 | 2.13 |
| DBT | 134 | 377.608 | 2.82 | 232 | 704.186 | 3.04 |
| DOE | 12 | 10.401 | 0.87 | 43 | 60.269 | 1.40 |
| DOS | 288 | 440.618 | 1.53 | 353 | 539.317 | 1.53 |
| DRDO | 298 | 226.893 | 0.76 | 501 | 603.306 | 1.20 |
| DST | 869 | 1889.444 | 2.17 | 1118 | 2734.009 | 2.45 |
| ICAR | 695 | 331.502 | 0.48 | 1060 | 951.676 | 0.90 |
| ICMR | 250 | 484.86 | 1.94 | 377 | 911.813 | 2.42 |
| MHFW | 203 | 392.794 | 1.93 | 363 | 1031.651 | 2.84 |
| MHRD | 52 | 58.052 | 1.12 | 84 | 86.401 | 1.03 |
| MNCES | 1 | 1.306 | 1.31 | 2 | 2.724 | 1.36 |
| MOC-DOC | 8 | 5.127 | 0.64 | 26 | 34.952 | 1.34 |
| MOCF-DCP | 7 | 4.974 | 0.71 | 21 | 24.842 | 1.18 |
| MOD | 4 | 3.24 | 0.81 | 16 | 70.541 | 4.41 |
| MOEN | 55 | 67.515 | 1.23 | 87 | 73.984 | 0.85 |
| MOER | 65 | 78.011 | 1.20 | 46 | 46.495 | 1.01 |
| MOHA | 2 | 0.992 | 0.50 | 6 | 4.779 | 0.80 |
| MOIT | 53 | 81.079 | 1.53 | 67 | 97.393 | 1.45 |
| MOM | 63 | 46.03 | 0.73 | 56 | 38.749 | 0.69 |
| MOP | 8 | 5.187 | 0.65 | 11 | 10.194 | 0.93 |
| MOTX | 14 | 7.444 | 0.53 | 8 | 6.121 | 0.77 |
| MOWR | 34 | 26.279 | 0.77 | 81 | 98.58 | 1.22 |
| MPNG | 1 | 1.173 | 1.17 | 2 | 1.474 | 0.74 |
| PUB | 189 | 446.421 | 2.36 | 406 | 1045.924 | 2.58 |
| STATE | 225 | 236.537 | 1.05 | 370 | 628.581 | 1.70 |
| Total R&D | 7166 | 11228.94 | 1.57 | 10609 | 20489.26 | 1.93 |

CSIR=Council of Scientific & Industrial Research; DAE=Department of Atomic Energy; DBT=Department of Biotechnology; DOE=Department of Electronics; DOS=Department of Space; DRDO=Defense Research & Development Organization; DST=Department of Science & Technology; ICAR=Indian Council of Agricultural Research; ICMR=Indian Council of Medical Research; MHFW=Ministry of Health & Family Welfare; MHRD=Ministry of Human Resource Development; MNCES=Ministry of Non-Conventional Energy Resources; MOC-DOC=Ministry of Commerce-Department of Commerce; MOCF-DCP=Ministry of Chemicals & Fertilizers-Department of Chemicals & Petrochemicals; MOD=Ministry of Defense; MOEN= ministry of Environment & Forests; MOER= Ministry of Earth Resources; MOHA=Ministry of Home Affairs; MOIT=Ministry of Information Technology & Communications; MOM: Ministry of Mines; MOP: Ministry of Mines; MOP: Ministry of Power; MOTX=Ministry of Textiles; MOWR: Ministry of Water Resources; MPNG: Ministry of Petroleum & Natural Gas; PU; Public Funding (Hospitals); state: State funding

Table 7. Industry Sector: Distribution of Papers by Type of Funding

| Funding Type | 2001 | | | 2006 | | |
|------------------|-----------------|----------|--------------------------|-----------------|----------|-----------------------|
| | Total Papers | Total IF | Average IF / Paper | Total Papers | Total IF | Average IF / Paper |
| Public Industry | 121 | 125.908 | 1.041 | 90 | 64.97 | 0.722 |
| Private Industry | 330 | 405.356 | 1.228 | 952 | 1406.534 | 1.477 |
| Total Industry | 451 | 529.888 | 1.175 | 1039 | 1468.214 | 1.413 |

Table 8. Others Sector: Distribution of Papers by Type of Institutions

| Type of Institutions | 2001 | | | 2006 | | |
|--------------------------|-----------------|----------|--------------------------|-----------------|----------|-----------------------|
| | Total Papers | Total IF | Average IF / Paper | Total Papers | Total IF | Average IF / Paper |
| Academies | 0 | 0 | 0.00 | 10 | 24.632 | 2.46 |
| Associations | 4 | 14.517 | 3.63 | 21 | 22.137 | 1.05 |
| Councils | 3 | 3.265 | 1.09 | 1 | 3.698 | 3.70 |
| Foundations | 124 | 211.967 | 1.71 | 178 | 482.885 | 2.71 |
| Hospitals | 491 | 1024.318 | 2.09 | 1015 | 2407.365 | 2.37 |
| Individuals | 138 | 209.311 | 1.52 | 197 | 215.954 | 1.10 |
| Organizations | 10 | 31.607 | 3.16 | 31 | 254.276 | 8.20 |
| Research Institutions | 255 | 442.737 | 1.74 | 372 | 837.987 | 2.25 |
| Societies | 22 | 56.803 | 2.58 | 46 | 115.586 | 2.51 |

| | | | | | | |
|---------------------|------|----------|------|------|----------|------|
| Trusts | 5 | 14.384 | 2.88 | 20 | 76.432 | 3.82 |
| Total Others sector | 1030 | 1954.085 | 1.90 | 1832 | 4246.782 | 2.32 |

Table 9. Others Sector: Distribution of Papers by Type of Funding

| Type of Funding | 2001 | | | 2006 | | |
|---------------------|--------------|----------|-------------------|--------------|----------|--------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF / Paper |
| International | 113 | 256.278 | 2.27 | 165 | 510.582 | 3.09 |
| Nonprofit | 262 | 464.725 | 1.77 | 401 | 1040.996 | 2.60 |
| Private | 672 | 1312.303 | 1.95 | 1307 | 2811.636 | 2.15 |
| Total Others Sector | 1832 | 4246.782 | 2.32 | 1030 | 1954.085 | 1.90 |

Table 10. Distribution of Papers by Broad Geographical Areas

| Geographical Areas | 2001 | | | 2006 | | |
|--------------------|--------------|----------|--------------------|--------------|----------|--------------------|
| | Total Papers | Total IF | Average IF / Paper | Total Papers | Total IF | Average IF / Paper |
| Andaman & Nicobar | 16 | 7.903 | 0.49 | 18 | 22.257 | 1.24 |
| Andhra Pradesh | 1592 | 2206.87 | 1.39 | 2590 | 4423.819 | 1.71 |
| Arunachal Pradesh | 0 | 0 | | 4 | 2.421 | 0.61 |
| Assam | 240 | 196.587 | 0.82 | 475 | 571.353 | 1.20 |
| Bihar | 123 | 59.028 | 0.48 | 89 | 79.562 | 0.89 |
| Chandigarh | 521 | 827.759 | 1.59 | 851 | 1809.327 | 2.13 |
| Chhattisgarh | 102 | 82.254 | 0.81 | 91 | 98.81 | 1.09 |
| Delhi | 2365 | 3558.936 | 1.50 | 3868 | 7502.305 | 1.94 |
| Goa | 97 | 113.402 | 1.17 | 215 | 360.702 | 1.68 |
| Gujarat | 620 | 823.616 | 1.33 | 975 | 1736.506 | 1.78 |
| Haryana | 345 | 207.509 | 0.60 | 551 | 539.586 | 0.98 |
| Himachal Pradesh | 135 | 64.714 | 0.48 | 251 | 232.068 | 0.92 |
| J&K | 87 | 98.686 | 1.13 | 233 | 307.008 | 1.32 |
| Jharkhand | 176 | 101.479 | 0.58 | 323 | 301.68 | 0.93 |
| Karnataka | 2305 | 3744.692 | 1.62 | 3645 | 6617.843 | 1.82 |
| Kerala | 661 | 780.01 | 1.18 | 1171 | 1965.971 | 1.68 |
| Lakshadweep | | | | 1 | 0.569 | 0.57 |
| Madhya Pradesh | 513 | 422.244 | 0.82 | 901 | 1184.34 | 1.31 |
| Maharashtra | 3113 | 4871.353 | 1.56 | 4512 | 8461.63 | 1.88 |
| Manipur | 21 | 8.865 | 0.42 | 29 | 21.748 | 0.75 |
| Meghalaya | 67 | 68.121 | 1.02 | 110 | 115.27 | 1.05 |
| Mizoram | 1 | 0.353 | 0.35 | 11 | 6.82 | 0.62 |
| Nagaland | 10 | 8.391 | 0.84 | 27 | 44.462 | 1.65 |
| Orissa | 391 | 458.608 | 1.17 | 463 | 677.845 | 1.46 |
| Pondicherry | 120 | 126.114 | 1.05 | 194 | 351.835 | 1.81 |
| Punjab | 348 | 410.815 | 1.18 | 732 | 981.951 | 1.34 |
| Rajasthan | 490 | 317.233 | 0.65 | 668 | 638.813 | 0.96 |
| Sikkim | 6 | 5.34 | 0.89 | 13 | 13.43 | 1.03 |
| Tamil Nadu | 2165 | 2347.656 | 1.08 | 4176 | 6173.971 | 1.48 |
| Tripura | 14 | 11.483 | 0.82 | 27 | 36.816 | 1.36 |
| Uttaranchal | 443 | 368.469 | 0.83 | 802 | 950.687 | 1.19 |
| Uttar Pradesh | 1968 | 2180.342 | 1.11 | 3373 | 5297.049 | 1.57 |
| West Bengal | 2154 | 2797.733 | 1.30 | 3658 | 6031.66 | 1.65 |
| Total | 19479 | 24756.1 | 1.27 | 30970 | 50613.04 | 1.63 |

Table 11. Share and Impact of Indian Papers and Indian International Collaborative Papers

| Year | Total Indian Papers | Total International Collaborative Papers | Share of International Collaborative Papers In Indian research output | Total IF of Indian papers | Total IF of Indian international collaborative papers | Average IF/Papers of total Indian papers | Average IF/Papers of total international collaborative papers |
|------|---------------------|--|---|---------------------------|---|--|---|
| 2001 | 19479 | 3256 | 16.72 | 24756.1 | 6704.486 | 1.27 | 2.06 |
| 2006 | 30970 | 5899 | 19.05 | 50613.04 | 13143.289 | 1.63 | 2.23 |

Table 12. Distribution of Indian International Collaborative Papers by Broad Geographical Continent

| Continent | 2001 | | | 2006 | | |
|--|-------------|----------|-------------------|--------------|-----------|-------------------|
| | Total apers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| Africa | 103 | 176.34 | 1.71 | 166 | 530.396 | 3.20 |
| Asia | 765 | 1469.631 | 1.92 | 1828 | 4130.443 | 2.26 |
| Europe | 1548 | 3441.169 | 2.22 | 2604 | 6509.491 | 2.50 |
| North America | 1419 | 3396.996 | 2.39 | 2277 | 6143.279 | 2.70 |
| Oceania | 129 | 244.281 | 1.89 | 269 | 732.896 | 2.72 |
| South America | 106 | 305.232 | 2.88 | 204 | 724.132 | 3.55 |
| Total International Collaborative Papers | 3256 | 6704.486 | 2.06 | 5899 | 13143.289 | 2.33 |

Table 13. Distribution of International Collaborative Papers by Major Countries

| Country | 2001 | | | 2006 | | |
|--|--------------|----------|-------------------|--------------|-----------|-------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| USA | 1238 | 3051.45 | 2.46 | 1987 | 5366.097 | 2.70 |
| Germany | 504 | 1172.435 | 2.33 | 745 | 1865.046 | 2.50 |
| UK | 368 | 846.222 | 2.3 | 662 | 1877.451 | 2.84 |
| Japan | 326 | 639.932 | 1.96 | 631 | 1489.071 | 2.36 |
| France | 290 | 715.264 | 2.47 | 477 | 1427.636 | 2.99 |
| South Korea | 60 | 197.787 | 3.3 | 337 | 806.957 | 2.39 |
| Canada | 188 | 389.948 | 2.07 | 306 | 940.046 | 3.07 |
| China | 115 | 362.622 | 3.15 | 277 | 941.509 | 3.40 |
| Italy | 168 | 371.538 | 2.21 | 246 | 694.007 | 2.82 |
| Australia | 117 | 229.506 | 1.96 | 245 | 707.87 | 2.89 |
| Switzerland | 85 | 323.141 | 3.80 | 174 | 856.19 | 4.92 |
| Taiwan | 75 | 133.337 | 1.78 | 162 | 401.971 | 2.48 |
| Spain | 79 | 188.254 | 2.38 | 147 | 390.336 | 2.66 |
| Russia | 67 | 205.042 | 3.06 | 146 | 586.01 | 4.01 |
| Malaysia | 39 | 28.338 | 0.73 | 138 | 266.55 | 1.93 |
| Brazil | 65 | 181.934 | 2.8 | 120 | 431.645 | 3.60 |
| Netherlands | 107 | 347.663 | 3.25 | 118 | 358.206 | 3.04 |
| Singapore | 41 | 56.728 | 1.38 | 118 | 302.273 | 2.56 |
| Sweden | 63 | 123.546 | 1.96 | 103 | 317.229 | 3.08 |
| Belgium | 44 | 104.852 | 2.38 | 84 | 221.218 | 2.63 |
| Israel | 34 | 75.928 | 2.23 | 78 | 202.208 | 2.59 |
| Denmark | 35 | 75.345 | 2.15 | 72 | 233.391 | 3.24 |
| Poland | 46 | 135.951 | 2.96 | 68 | 122.191 | 1.80 |
| Argentina | 24 | 92.933 | 3.87 | 54 | 239.536 | 4.44 |
| Mexico | 45 | 132.871 | 2.95 | 54 | 142.975 | 2.65 |
| Thailand | 30 | 47.575 | 1.59 | 53 | 222.624 | 4.20 |
| South Africa | 36 | 60.517 | 1.68 | 52 | 216.12 | 4.16 |
| Total International collaborative papers | 3256 | 6704.486 | 2.06 | 5899 | 13143.289 | 2.33 |

Table 14. Distribution of Indian International Collaborative Papers by Broad Geographical Continent/Regions

| Region | 2001 | | | 2006 | | |
|--|--------------|-----------------|----------------------|--------------|-----------------|----------------------|
| | Total Papers | Total IF | Average IF/ Paper | Total Papers | Total IF | Average IF/ Paper |
| Asia | 765 | 1469.631 | 1.92 | 1828 | 4130.443 | 2.26 |
| Central Asia | 12 | 27.066 | 2.26 | 11 | 51.796 | 4.71 |
| South Asia | 56 | 109.114 | 1.95 | 83 | 374.64 | 4.51 |
| South East Asia | 124 | 161.362 | 1.30 | 336 | 777.387 | 2.31 |
| East Asia | 510 | 1064.623 | 2.09 | 1254 | 2899.064 | 2.31 |
| Middle East Asia | 116 | 260.842 | 2.25 | 254 | 632.104 | 2.49 |
| Europe | 1548 | 3441.169 | 2.22 | 2604 | 6509.491 | 2.50 |
| Central Europe | 647 | 1597.097 | 2.47 | 1054 | 2986.329 | 2.83 |
| East Europe | 84 | 244.7 | 2.91 | 176 | 668.372 | 3.80 |
| North Europe | 493 | 1085.342 | 2.20 | 896 | 2422.739 | 2.70 |
| South Europe | 257 | 583.877 | 2.27 | 443 | 1166.733 | 2.63 |
| West Europe | 401 | 995.418 | 2.48 | 645 | 1827.955 | 2.83 |
| Africa | 103 | 176.34 | 1.71 | 166 | 530.396 | 3.20 |
| East Africa | 32 | 75.538 | 2.36 | 42 | 125.167 | 2.98 |
| Middle Africa | 0 | 0 | 0.00 | 8 | 46.058 | 5.76 |
| North Africa | 15 | 17.77 | 1.18 | 46 | 146.659 | 3.19 |
| South Africa | 36 | 60.517 | 1.68 | 56 | 221.574 | 3.96 |
| West Africa | 22 | 25.345 | 1.15 | 33 | 119.455 | 3.62 |
| North America | 1419 | 3396.996 | 2.39 | 2277 | 6143.279 | 2.70 |
| South America | 106 | 305.232 | 2.88 | 204 | 724.132 | 3.55 |
| Oceania | 129 | 244.281 | 1.89 | 269 | 732.896 | 2.72 |
| Total International Collaborative Papers | 3256 | 6704.486 | 2.06 | 5899 | 13143.289 | 2.33 |

Table 15. Distribution of Papers and Impact by Broad Main Subjects, 2001 & 2006

| Main Subjects | 2001 | | | 2006 | | |
|--------------------------|--------|----------|-----------------------|--------|----------|-----------------------|
| | Papers | Total IF | Average IF/ Papers | Papers | Total IF | Average IF/ Papers |
| Agricultural & Food Sci. | 2043 | 893.408 | 0.44 | 2401 | 2008.451 | 0.84 |
| Basic Life Sciences | 1943 | 4063.174 | 2.09 | 3315 | 7796.518 | 2.35 |
| Biological Sciences | 814 | 890.811 | 1.09 | 1166 | 1711.13 | 1.47 |
| Biomedical Sciences | 1651 | 2530.464 | 1.53 | 3193 | 7011.104 | 2.20 |
| Chemistry | 4476 | 5251.745 | 1.17 | 7148 | 12154.51 | 1.70 |
| Clinical Medicine | 1892 | 3615.802 | 1.91 | 3996 | 9547.485 | 2.39 |
| Computer Science | 443 | 242.432 | 0.55 | 1479 | 644.656 | 0.44 |
| Earth & Envir. Sci. | 1240 | 1102.524 | 0.89 | 1998 | 2540.161 | 1.27 |
| Engineering Sciences | 3835 | 2779.132 | 0.72 | 6561 | 7559.596 | 1.15 |
| Mathematics & Statistics | 557 | 260.067 | 0.47 | 698 | 464.761 | 0.67 |
| Multi-disciplinary | 897 | 1068.291 | 1.19 | 907 | 1242.315 | 1.37 |
| Physics & Astronomy | 3766 | 6714.158 | 1.78 | 5838 | 10510.43 | 1.80 |
| Total | 19479 | 24756.1 | 1.27 | 30970 | 50613.04 | 1.63 |

Table 16. Distribution Of Papers By Broad Subjects (DST Classification)

| Subjects | 2001 | | | 2006 | | |
|--------------------------------|--------------|----------|----------------------|--------------|----------|----------------------|
| | Total Papers | Total IF | Average IF/ paper | Total Papers | Total IF | Average IF/ paper |
| Agricultural Sciences | 2043 | 893.408 | 0.44 | 2401 | 2008.451 | 0.84 |
| Biological Sciences | 2565 | 4591.148 | 1.79 | 4272 | 8986.587 | 2.10 |
| Chemical Sciences | 4471 | 5243.627 | 1.17 | 7146 | 12150.75 | 1.70 |
| Earth & Environmental Sciences | 1239 | 1102.119 | 0.89 | 1998 | 2540.161 | 1.27 |
| Engineering & Technology | 4271 | 3019.368 | 0.71 | 7932 | 8161.633 | 1.03 |
| Mathematics | 556 | 258.949 | 0.47 | 698 | 464.761 | 0.67 |
| Medical Sciences | 3260 | 5846.811 | 1.79 | 6668 | 15609.57 | 2.34 |
| Physical Sciences (Physics) | 3755 | 6703.741 | 1.79 | 5832 | 10494.76 | 1.80 |
| Total | 19479 | 24756.1 | 1.27 | 30970 | 50613.04 | 1.63 |

Table 17. Distribution of Papers in Agriculture & Food Sciences

| Subject | 2001 | | | 2006 | | |
|--------------------------------------|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Agriculture, Dairy & Animal Sciences | 299 | 48.811 | 0.16 | 370 | 146.14 | 0.39 |
| Agriculture, Multidisciplinary | 247 | 60.16 | 0.24 | 323 | 138.911 | 0.43 |
| Agronomy | 434 | 254.867 | 0.59 | 274 | 278.728 | 1.02 |
| Fisheries | 32 | 31.594 | 0.99 | 142 | 196.699 | 1.39 |
| Food Science & Technology | 386 | 232.271 | 0.60 | 606 | 654.674 | 1.08 |
| Forestry | 19 | 16.376 | 0.86 | 42 | 38.596 | 0.92 |
| Horticulture | 62 | 47.487 | 0.77 | 104 | 72.879 | 0.70 |
| Nutrition & Dietetics | 79 | 117.533 | 1.49 | 180 | 370.149 | 2.06 |
| Soil Science | 65 | 56.002 | 0.86 | 64 | 98.66 | 1.54 |
| Veterinary Sciences | 527 | 137.795 | 0.26 | 495 | 324.273 | 0.66 |
| Total | 2043 | 893.408 | 0.44 | 2401 | 2008.451 | 0.84 |

Table 18. Distribution of Papers in Basic Life Sciences

| Subject | 2001 | | | 2006 | | |
|---|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Biochemical Research Methods | 99 | 162.363 | 1.64 | 234 | 513.893 | 2.20 |
| Biochemistry & Molecular Biology | 762 | 2026.346 | 2.66 | 1380 | 3696.025 | 2.68 |
| Biophysics | 223 | 493.511 | 2.21 | 316 | 737.572 | 2.33 |
| Biotechnology & Applied Microbiology | 469 | 539.6 | 1.15 | 808 | 1472.415 | 1.82 |
| Cell Biology | 261 | 777.719 | 2.98 | 363 | 1126.824 | 3.10 |
| Dentistry, Oral Surgery & Medicine | 37 | 39.979 | 1.08 | 95 | 140.694 | 1.48 |
| Developmental Biology | 54 | 81.027 | 1.50 | 27 | 92.441 | 3.42 |
| Evolutionary Biology | 21 | 39.134 | 1.86 | 31 | 72.703 | 2.35 |
| Genetics & Heredity | 193 | 573.481 | 2.97 | 241 | 697.788 | 2.90 |
| Health Care Sciences & Services | 10 | 10.714 | 1.07 | 34 | 63.482 | 1.87 |
| Health Policy & Services | 2 | 1.292 | 0.65 | 17 | 40.057 | 2.36 |
| Microbiology | 236 | 424.739 | 1.80 | 345 | 816.334 | 2.37 |
| Nursing | 0 | 0 | 0 | 2 | 0.816 | 0.41 |
| Public, Environmental & Occupational Health | 149 | 182.786 | 1.23 | 245 | 435.631 | 1.78 |
| Substance Abuse | 4 | 5.735 | 1.43 | 9 | 22.933 | 2.55 |
| Total | 1943 | 4063.174 | 2.09 | 3315 | 7796.518 | 2.35 |

Table 19. Distribution of Papers in Biomedical Sciences

| Subject | 2001 | | | 2006 | | |
|---|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Anatomy & Morphology | 6 | 7.702 | 1.28 | 18 | 16.073 | 0.89 |
| Andrology | 21 | 13.306 | 0.63 | 12 | 20.754 | 1.73 |
| Engineering, Biomedical | 31 | 48.581 | 1.57 | 40 | 82.849 | 2.07 |
| Immunology | 212 | 446.61 | 2.11 | 461 | 1144.656 | 2.48 |
| Infectious Diseases | 154 | 364.366 | 2.37 | 215 | 608.248 | 2.83 |
| Medicine, Research & Experimental | 104 | 146.825 | 1.41 | 305 | 576.633 | 1.89 |
| Neuroimaging | 12 | 13.86 | 1.16 | 25 | 51.171 | 2.05 |
| Neurosciences | 232 | 340.443 | 1.47 | 537 | 1287.944 | 2.40 |
| Oncology | 145 | 319.744 | 2.21 | 347 | 1284.236 | 3.70 |
| Parasitology | 44 | 56.61 | 1.29 | 64 | 112.492 | 1.76 |
| Pathology | 143 | 137.212 | 0.96 | 191 | 284.162 | 1.49 |
| Pharmacology & Pharmacy | 468 | 577.679 | 1.23 | 819 | 1500.134 | 1.83 |
| Physiology | 32 | 45.018 | 1.41 | 100 | 133.266 | 1.33 |
| Radiology, Nuclear Medicine & Medical Imaging | 116 | 189.246 | 1.63 | 187 | 340.244 | 1.82 |

| | | | | | | |
|--------------------------------|------|----------|------|------|----------|------|
| Reproductive Biology | 37 | 72.703 | 1.96 | 85 | 211.193 | 2.48 |
| Social Sciences, Biomedical | 0 | 0 | 0 | 2 | 2.444 | 1.22 |
| Toxicology | 206 | 252.325 | 1.22 | 356 | 623.544 | 1.75 |
| Virology | 57 | 178.737 | 3.14 | 125 | 300.957 | 2.41 |
| Total | 1651 | 2530.464 | 1.53 | 3193 | 7011.104 | 2.20 |

Table 20. Distribution of Papers in Biological Sciences

| Subject | 2001 | | | 2006 | | |
|---|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Biodiversity Conservation | 13 | 20.629 | 1.59 | 20 | 37.619 | 1.88 |
| Biology | 134 | 256.932 | 1.92 | 168 | 342.835 | 2.04 |
| Entomology | 74 | 52.838 | 0.71 | 107 | 105.518 | 0.99 |
| | 39 | 47.662 | 1.22 | 115 | 204.833 | 1.78 |
| Marine & Freshwater Biology | | | | | | |
| Mathematical & Computational Biology | 14 | 13.332 | 0.95 | 28 | 49.329 | 1.76 |
| Mycology | 28 | 22.904 | 0.82 | 51 | 56.861 | 1.11 |
| Ornithology | 0 | 0 | 0 | 5 | 5.025 | 1.01 |
| Plant Sciences | 451 | 435.632 | 0.97 | 599 | 826.443 | 1.38 |
| Zoology | 75 | 54.551 | 0.73 | 112 | 126.846 | 1.13 |
| Total | 814 | 890.811 | 1.09 | 1166 | 1711.13 | 1.47 |

Table 21. Distribution of Papers in Chemistry

| Subject | 2001 | | | 2006 | | |
|----------------------------------|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Chemistry | 26 | 48.666 | 1.87 | 106 | 259.067 | 2.44 |
| Chemistry Analytical | 270 | 323.651 | 1.20 | 479 | 821.389 | 1.71 |
| Chemistry Applied | 293 | 209.055 | 0.71 | 485 | 684.42 | 1.41 |
| Chemistry Inorganic & Nuclear | 382 | 459.907 | 1.20 | 702 | 1176.633 | 1.68 |
| Chemistry Medicinal | 245 | 248.998 | 1.02 | 516 | 947.404 | 1.84 |
| Chemistry Multidisciplinary | 1394 | 1264.62 | 0.91 | 1765 | 2273.677 | 1.29 |
| Chemistry Organic | 943 | 1327.836 | 1.41 | 1558 | 2858.152 | 1.83 |
| Chemistry Physical | 852 | 1465.379 | 1.72 | 1478 | 3232.824 | 2.19 |
| Electrochemistry | 145 | 138.639 | 0.96 | 295 | 644.351 | 2.18 |
| Polymer Science | 463 | 440.277 | 0.95 | 836 | 1245.149 | 1.49 |
| Total | 4476 | 5251.745 | 1.17 | 7148 | 12154.51 | 1.70 |

Table 22. Distribution of Papers in Clinical Medicine

| Subject | 2001 | | | 2006 | | |
|--|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Allergy | 13 | 18.467 | 1.42 | 25 | 104.977 | 4.20 |
| Anesthesiology | 56 | 82.891 | 1.48 | 185 | 340.732 | 1.84 |
| Cardiac & Cardiovascular Systems | 136 | 406.741 | 2.99 | 232 | 757.475 | 3.26 |
| Chemistry, Medicinal | 245 | 248.998 | 1.02 | 516 | 947.404 | 1.84 |
| Clinical Neurology | 143 | 242.151 | 1.69 | 479 | 1131.203 | 2.36 |
| Critical Care Medicine | 24 | 33.612 | 1.40 | 61 | 121.279 | 1.99 |
| Dermatology | 134 | 133.477 | 1.00 | 149 | 203.26 | 1.36 |
| Emergency Medicine | 3 | 2.978 | 0.99 | 26 | 9.64 | 0.37 |
| Endocrinology & Metabolism | 93 | 220.46 | 2.37 | 179 | 587.388 | 3.28 |
| Gastroenterology & Hepatology | 89 | 408.814 | 4.59 | 205 | 551.599 | 2.69 |
| Geriatrics & Gerontology | 9 | 10.045 | 1.12 | 29 | 74.355 | 2.56 |
| Gerontology | 4 | 3.676 | 0.92 | 13 | 23.801 | 1.83 |
| Hematology | 90 | 331.35 | 3.68 | 113 | 507.337 | 4.49 |
| Integrative & Complementary Medicine | 48 | 36.321 | 0.76 | 82 | 102.611 | 1.25 |
| Medical Ethics | 0 | 0 | 0 | 2 | 2.444 | 1.22 |
| Medical Informatics | 1 | 0.655 | 0.66 | 2 | 0.858 | 0.43 |

| | | | | | | |
|-------------------------------|------|----------|------|------|----------|------|
| Medical Laboratory Technology | 67 | 79.522 | 1.19 | 130 | 208.097 | 1.60 |
| Medicine. | 2 | 6.265 | 3.13 | 4 | 11.096 | 2.77 |
| Medicine, General & Internal | 253 | 692.355 | 2.74 | 466 | 2500.072 | 5.36 |
| Obstetrics & Gynecology | 76 | 85.8 | 1.13 | 136 | 236.781 | 1.74 |
| Ophthalmology | 153 | 271.647 | 1.78 | 229 | 430.704 | 1.88 |
| Orthopedics | 28 | 26.994 | 0.96 | 53 | 76.454 | 1.44 |
| Otorhinolaryngology | 41 | 24.212 | 0.59 | 49 | 43.976 | 0.90 |
| Pediatrics | 160 | 138.754 | 0.87 | 684 | 321.396 | 0.47 |
| Peripheral Vascular Disease | 32 | 202.975 | 6.34 | 63 | 304.153 | 4.83 |
| Psychiatry | 55 | 168.102 | 3.06 | 133 | 410.681 | 3.09 |
| Psychology, Biological | 1 | 1.328 | 1.33 | 6 | 25.2 | 4.20 |
| Psychology, Clinical | 0 | 0 | 0 | 0 | 0 | 0 |
| Respiratory System | 61 | 115.431 | 1.89 | 168 | 444.572 | 2.65 |
| Rheumatology | 20 | 43.517 | 2.18 | 29 | 97.723 | 3.37 |
| Sport Sciences | 7 | 5.12 | 0.73 | 19 | 24.895 | 1.31 |
| Surgery | 341 | 412.634 | 1.21 | 470 | 755.917 | 1.61 |
| Transplantation | 28 | 31.6 | 1.42 | 68 | 175.076 | 4.20 |
| Tropical Medicine | 100 | 81.747 | 1.48 | 145 | 191.33 | 1.84 |
| Urology & Nephrology | 93 | 127.501 | 2.99 | 166 | 364.122 | 3.26 |
| Total | 1892 | 3615.802 | 1.02 | 3996 | 9547.485 | 1.84 |

Table 23. Distribution of Papers in Computer Science

| Subject | 2001 | | | 2006 | | |
|--|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Automation & Control Systems | 47 | 29.155 | 0.62 | 144 | 95.516 | 0.66 |
| Communication | 2 | 1.25 | 0.63 | 5 | 3.417 | 0.68 |
| Computer Science, | 34 | 25.13 | 0.74 | 91 | 75.124 | 0.83 |
| Computer Science, Artificial Intelligence | 78 | 66.38 | 0.85 | 220 | 166.987 | 0.76 |
| Computer Science, Cybernetics | 4 | 1.53 | 0.38 | 5 | 4.707 | 0.94 |
| Computer Science, Hardware & Architecture | 46 | 30.765 | 0.67 | 63 | 40.407 | 0.64 |
| Computer Science, Information Systems | 43 | 28.732 | 0.67 | 111 | 149.937 | 1.35 |
| Computer Science, Interdisciplinary Applications | 97 | 53.426 | 0.55 | 156 | 130.703 | 0.84 |
| Computer Science, Software Engineering | 47 | 28.987 | 0.62 | 58 | 45.499 | 0.78 |
| Computer Science, Theory & Methods | 135 | 28.986 | 0.21 | 795 | 58.665 | 0.07 |
| Information Science & Library Science | 7 | 4.376 | 0.63 | 19 | 20.455 | 1.08 |
| Total | 443 | 242.432 | 0.55 | 1479 | 644.656 | 0.44 |

Table 24. Distribution of Papers in Earth & Environmental Sciences

| Subject | 2001 | | | 2006 | | |
|----------------------------|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Ecology | 69 | 89.338 | 1.29 | 118 | 199.643 | 1.69 |
| Engineering, Environmental | 75 | 66.689 | 0.89 | 208 | 329.592 | 1.58 |
| Engineering, Geological | 44 | 18.861 | 0.43 | 68 | 45.564 | 0.67 |
| Engineering, Marine | 1 | 0.102 | 0.10 | 4 | 1.69 | 0.42 |
| Engineering, Ocean | 29 | 10.304 | 0.36 | 38 | 18.56 | 0.49 |
| Engineering, Petroleum | 12 | 4.478 | 0.37 | 30 | 7.215 | 0.24 |
| Environmental Sciences | 423 | 386.289 | 0.91 | 867 | 1217.914 | 1.40 |
| Environmental Studies | 18 | 12.663 | 0.70 | 38 | 53.339 | 1.40 |
| Geochemistry & | 87 | 125.226 | 1.44 | 146 | 274.9 | 1.88 |

| | | | | | | |
|---|------|----------|------|------|----------|------|
| Geophysics | | | | | | |
| Geology | 18 | 23.875 | 1.33 | 21 | 30.907 | 1.47 |
| Geosciences, Multidisciplinary | 409 | 298.846 | 0.73 | 527 | 508.488 | 0.96 |
| Imaging Science & Photographic Technology | 27 | 23.199 | 0.86 | 61 | 75.055 | 1.23 |
| Limnology | 6 | 6.146 | 1.02 | 16 | 15.527 | 0.97 |
| Meteorology & Atmospheric Sciences | 112 | 165.375 | 1.48 | 160 | 285.12 | 1.78 |
| Mineralogy | 38 | 31.443 | 0.83 | 52 | 65.949 | 1.27 |
| Oceanography | 89 | 46.887 | 0.53 | 92 | 69.751 | 0.76 |
| Paleontology | 20 | 22.448 | 1.12 | 23 | 26.963 | 1.17 |
| Remote Sensing | 31 | 28.855 | 0.93 | 69 | 79.215 | 1.15 |
| Water Resources | 159 | 112.398 | 0.71 | 240 | 279 | 1.16 |
| Total | 1240 | 1102.524 | 0.89 | 1998 | 2540.161 | 1.27 |

Table 25. Distribution of Papers in Engineering Sciences

| Subject | 2001 | | | 2006 | | |
|---|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Agricultural Engineering | 86 | 55.38 | 0.64 | 97 | 36.515 | 0.38 |
| Energy & Fuels | 217 | 170.267 | 0.78 | 40 | 82.849 | 2.07 |
| Engineering, | 13 | 6.932 | 0.53 | 830 | 1112.102 | 1.34 |
| Engineering, Aerospace | 72 | 19.712 | 0.27 | 370 | 393.692 | 1.06 |
| Engineering, Biomedical | 31 | 48.581 | 1.57 | 735 | 617.92 | 0.84 |
| Engineering, Chemical | 474 | 388.382 | 0.82 | 208 | 329.592 | 1.58 |
| Engineering, Civil | 132 | 65.267 | 0.49 | 68 | 45.564 | 0.67 |
| Engineering, Electrical & Electronic | 413 | 244.979 | 0.59 | 172 | 68.437 | 0.40 |
| Engineering, Environmental | 75 | 66.689 | 0.89 | 250 | 143.969 | 0.58 |
| Engineering, Geological | 44 | 18.861 | 0.43 | 4 | 1.69 | 0.42 |
| Engineering, Industrial | 179 | 38.315 | 0.21 | 480 | 384.524 | 0.80 |
| Engineering, Manufacturing | 85 | 28.849 | 0.34 | 223 | 246.734 | 1.11 |
| Engineering, Marine | 1 | 0.102 | 0.10 | 38 | 18.56 | 0.49 |
| Engineering, Mechanical | 252 | 163.281 | 0.65 | 30 | 7.215 | 0.24 |
| Engineering, Multidisciplinary | 189 | 50.791 | 0.27 | 4 | 1.787 | 0.45 |
| Engineering, Ocean | 29 | 10.304 | 0.36 | 354 | 426.179 | 1.20 |
| Engineering, Petroleum | 12 | 4.478 | 0.37 | 328 | 696.542 | 2.12 |
| Ergonomics | 0 | 0 | 0 | 42 | 91.845 | 2.19 |
| Instruments & Instrumentation | 134 | 140.331 | 1.05 | 179 | 192.159 | 1.07 |
| Materials Science, | 92 | 85.207 | 0.93 | 118 | 80.59 | 0.68 |
| Materials Science, Biomaterials | 25 | 38.53 | 1.54 | 200 | 290.421 | 1.45 |
| Materials Science, Ceramics | 86 | 55.38 | 0.64 | 97 | 36.515 | 0.38 |
| Materials Science, Characterization & Testing | 217 | 170.267 | 0.78 | 40 | 82.849 | 2.07 |
| Materials Science, Coatings & Films | 13 | 6.932 | 0.53 | 830 | 1112.102 | 1.34 |
| Materials Science, Composites | 72 | 19.712 | 0.27 | 370 | 393.692 | 1.06 |
| Materials Science, Multidisciplinary | 31 | 48.581 | 1.57 | 735 | 617.92 | 0.84 |
| Materials Science, Paper & Wood | 474 | 388.382 | 0.82 | 208 | 329.592 | 1.58 |
| Materials Science, Textiles | 132 | 65.267 | 0.49 | 68 | 45.564 | 0.67 |

| | | | | | | |
|--|------|----------|------|------|----------|------|
| Mechanics | 413 | 244.979 | 0.59 | 172 | 68.437 | 0.40 |
| Metallurgy & Metallurgical Engineering | 75 | 66.689 | 0.89 | 250 | 143.969 | 0.58 |
| Microscopy | 44 | 18.861 | 0.43 | 4 | 1.69 | 0.42 |
| Mining & Mineral Processing | 179 | 38.315 | 0.21 | 480 | 384.524 | 0.80 |
| Nanoscience & Nanotechnology | 85 | 28.849 | 0.34 | 223 | 246.734 | 1.11 |
| Nuclear Science & Technology | 1 | 0.102 | 0.10 | 38 | 18.56 | 0.49 |
| Operations Research & Management Science | 252 | 163.281 | 0.65 | 30 | 7.215 | 0.24 |
| Robotics | 189 | 50.791 | 0.27 | 4 | 1.787 | 0.45 |
| Telecommunications | 29 | 10.304 | 0.36 | 354 | 426.179 | 1.20 |
| Transportation Science & Technology | 12 | 4.478 | 0.37 | 328 | 696.542 | 2.12 |
| Total | 3835 | 2779.132 | 0.72 | 6561 | 7559.596 | 1.15 |

Table 26. Distribution of Papers in Mathematics & Statistics

| Subject | 2001 | | | 2006 | | |
|---|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Mathematics | 270 | 78.532 | 0.29 | 277 | 118.463 | 0.43 |
| Mathematics, Applied | 169 | 78.555 | 0.46 | 312 | 212.625 | 0.68 |
| Mathematics, Interdisciplinary Applications | 84 | 62.503 | 0.74 | 94 | 115.278 | 1.23 |
| Total | 557 | 260.067 | 0.47 | 698 | 464.761 | 0.67 |

Table 27. Distribution of Papers in Physics & Astronomy

| Subject | 2001 | | | 2006 | | |
|---------------------------------------|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Acoustics | 64 | 60.166 | 0.94 | 103 | 91.176 | 0.89 |
| Astronomy & Astrophysics | 440 | 1223.006 | 2.78 | 501 | 1548.558 | 3.09 |
| Crystallography | 360 | 250.879 | 0.70 | 713 | 918.506 | 1.29 |
| Optics | 272 | 404.699 | 1.49 | 404 | 650.171 | 1.61 |
| Physics, | 171 | 172.737 | 1.01 | 273 | 329.49 | 1.21 |
| Physics, Applied | 502 | 672.206 | 1.34 | 810 | 1446.599 | 1.79 |
| Physics, Atomic, Molecular & Chemical | 341 | 800.433 | 2.35 | 529 | 1223.644 | 2.31 |
| Physics, Condensed Matter | 467 | 746.548 | 1.60 | 991 | 1445.08 | 1.46 |
| Physics, Fluids & Plasmas | 178 | 368.005 | 2.07 | 175 | 364.383 | 2.08 |
| Physics, Mathematical | 241 | 360.038 | 1.49 | 250 | 396.909 | 1.59 |
| Physics, Multidisciplinary | 689 | 1205.211 | 1.75 | 923 | 1623.156 | 1.76 |
| Physics, Nuclear | 174 | 328.661 | 1.89 | 206 | 414.448 | 2.01 |
| Physics, Particles & Fields | 288 | 1178.815 | 4.09 | 293 | 968.405 | 3.31 |
| Spectroscopy | 110 | 142.996 | 1.30 | 230 | 346.186 | 1.51 |
| Thermodynamics | 126 | 97.352 | 0.77 | 224 | 249.997 | 1.12 |
| Total | 3766 | 6714.158 | 1.78 | 5838 | 10510.43 | 1.80 |

Table 28. Contribution of Top 15 Organizations in India

| Institute Name | 2001 | | | 2006 | | |
|--|--------------|----------|------------------|--------------|----------|------------------|
| | Total Papers | Total IF | Average IF/Paper | Total Papers | Total IF | Average IF/Paper |
| Indian Institute of Science, Bangalore | 928 | 1898.05 | 2.045 | 1243 | 2488.059 | 2.002 |
| Indian Institute of Technology, Kharagpur | 439 | 386.349 | 0.880 | 916 | 1252.954 | 1.368 |
| Indian Institute of Technology, Delhi | 376 | 340.931 | 0.907 | 721 | 905.864 | 1.256 |
| Bhabha Atomic Research Center, Mumbai | 557 | 744.513 | 1.337 | 766 | 1349.452 | 1.762 |
| All India Institute of Medical Sciences, Delhi | 442 | 770.883 | 1.744 | 728 | 1933.781 | 2.656 |
| Indian Institute of Technology, Chennai | 334 | 327.227 | 0.980 | 686 | 873.57 | 1.273 |
| Indian Institute of Technology, Mumbai | 385 | 453.317 | 1.177 | 650 | 1017.022 | 1.565 |
| Indian Institute of Technology, Kanpur | 363 | 465.422 | 1.282 | 658 | 1110.176 | 1.687 |
| University Of Delhi, Delhi | 318 | 424.828 | 1.336 | 417 | 794.821 | 1.906 |
| Indian Institute of Chemical Technology, Hyderabad | 287 | 511.178 | 1.781 | 545 | 1143.937 | 2.099 |
| Banaras Hindu University, Varanasi | 234 | 245.207 | 1.048 | 310 | 512.853 | 1.654 |
| Jadavpur University, Kolkata | 276 | 359.464 | 1.302 | 504 | 691.692 | 1.372 |
| Tata Institute Of Fundamental Research, Mumbai | 431 | 1181.264 | 2.741 | 388 | 864.529 | 2.228 |
| National Chemical Laboratory, Pune | 341 | 650.018 | 1.906 | 436 | 987.978 | 2.266 |
| University of Madras, Chennai | 157 | 183.621 | 1.170 | 300 | 478.035 | 1.593 |

