

## APPENDIX

Table 1.1: Global trends in population, GDP and Internet penetration, 2015 and 2018

	Population (millions)		Share of global population (%)		GDP (constant 2017 PPP\$ billions)		Share of global GDP (%)		Internet users per 100 population	
	2015	2018	2015	2018	2015	2018	2015	2018	2015	2019
<b>World</b>	<b>7 371.65</b>	<b>7 623.14</b>	<b>100.00</b>	<b>100.00</b>	<b>111 572.24</b>	<b>123 921.67</b>	<b>100.00</b>	<b>100.00</b>	<b>41.68</b>	<b>48.40</b>
High-income	1 317.84	1 336.22	17.88	17.53	58 393.14	62 180.54	52.34	50.18	78.87	87.99
Upper middle-income	2 489.47	2 547.57	33.77	33.42	34 635.03	39 839.99	31.04	32.15	51.57	60.38
Lower middle-income	2 679.21	2 792.32	36.34	36.63	16 470.51	19 425.00	14.76	15.68	23.45	29.06
Low-income	885.12	947.04	12.01	12.42	2 073.55	2 476.14	1.86	2.00	12.83	17.53
<b>Americas</b>	<b>975.79</b>	<b>1 001.65</b>	<b>13.24</b>	<b>13.14</b>	<b>29 586.63</b>	<b>31 384.17</b>	<b>26.52</b>	<b>25.33</b>	<b>62.44</b>	<b>75.32</b>
North America	356.90	364.17	4.84	4.78	20 474.17	21 918.82	18.35	17.69	76.11	89.41
Latin America	581.05	598.77	7.88	7.85	8 841.44	9 163.95	7.92	7.39	55.69	67.91
Caribbean	37.84	38.71	0.51	0.51	271.01	301.40	0.24	0.24	37.23	57.66
<b>Europe</b>	<b>822.27</b>	<b>829.46</b>	<b>11.15</b>	<b>10.88</b>	<b>28 681.87</b>	<b>30 779.74</b>	<b>25.71</b>	<b>24.84</b>	<b>72.23</b>	<b>82.16</b>
European Union	508.56	511.68	6.90	6.71	21 093.72	22 607.01	18.91	18.24	77.77	85.05
Southeast Europe	17.90	17.72	0.24	0.23	231.31	254.15	0.21	0.21	63.23	74.80
European Free Trade Assoc.	13.86	14.24	0.19	0.19	886.25	939.28	0.79	0.76	91.26	95.11
Eastern Europe	281.95	285.82	3.82	3.75	6 470.59	6 979.30	5.80	5.63	61.89	76.81
<b>Africa</b>	<b>1 180.80</b>	<b>1 274.21</b>	<b>16.02</b>	<b>16.71</b>	<b>5 612.87</b>	<b>6 130.69</b>	<b>5.03</b>	<b>4.95</b>	<b>23.96</b>	<b>24.20</b>
Sub-Saharan Africa	953.42	1 033.08	12.93	13.55	3 555.34	3 834.12	3.19	3.09	20.52	18.21
Arab States in Africa	227.38	241.13	3.08	3.16	2 057.53	2 296.58	1.84	1.85	38.40	50.04
<b>Asia</b>	<b>4 353.78</b>	<b>4 477.14</b>	<b>59.06</b>	<b>58.73</b>	<b>46 311.07</b>	<b>54 127.88</b>	<b>41.51</b>	<b>43.68</b>	<b>35.81</b>	<b>42.94</b>
Central Asia	71.48	75.22	0.97	0.99	774.47	876.02	0.69	0.71	42.81	54.04
Arab States in Asia	153.42	162.22	2.08	2.13	3 400.25	3 571.97	3.05	2.88	55.69	70.07
West Asia	103.04	107.09	1.40	1.40	1 535.48	1 799.86	1.38	1.45	51.25	72.94
South Asia	1 749.36	1 814.01	23.73	23.80	8 996.76	10 979.85	8.06	8.86	16.22	20.21
East & Southeast Asia	2 276.49	2 318.60	30.88	30.42	31 604.10	36 900.18	28.33	29.78	48.74	57.31
<b>Oceania</b>	<b>39.03</b>	<b>40.72</b>	<b>0.53</b>	<b>0.53</b>	<b>1 379.94</b>	<b>1 499.34</b>	<b>1.24</b>	<b>1.21</b>	<b>65.64</b>	<b>69.41</b>
<b>Other groupings</b>										
Least developed countries	942.30	1 011.00	12.78	13.26	2 433.00	2 815.98	2.18	2.27	13.71	17.74
All Arab States	380.80	403.35	5.17	5.29	5 457.78	5 868.55	4.89	4.74	45.37	58.09
OECD	1 275.10	1 296.63	17.30	17.01	55 038.06	58 890.90	49.33	47.52	76.50	85.62
G20	4 723.61	4 826.67	64.08	63.32	91 421.33	101 355.99	81.94	81.79	47.63	54.84
Org. Islamic Co-op.	1 734.69	1 838.15	23.53	24.11	15 927.97	17 885.89	14.28	14.43	30.36	38.14
<b>Selected countries</b>										
Argentina	43.08	44.36	0.58	0.58	1 032.32	1 012.07	0.93	0.82	68.04	74.29 <sup>2</sup>
Australia	23.93	24.90	0.32	0.33	1 143.65	1 238.54	1.03	1.00	84.56	86.55 <sup>2</sup>
Brazil	204.47	209.47	2.77	2.75	3 079.19	3 057.47	2.76	2.47	58.33	70.43 <sup>1</sup>
Canada	36.03	37.07	0.49	0.49	1 705.54	1 813.03	1.53	1.46	90.00	91.00 <sup>2</sup>
China	1 406.85	1 427.65	19.08	18.73	17 403.45	21 229.73	15.60	17.13	50.30	54.30 <sup>2</sup>
Egypt	92.44	98.42	1.25	1.29	977.16	1 118.72	0.88	0.90	37.82	57.30
France	64.45	64.99	0.87	0.85	2 898.40	3 051.03	2.60	2.46	78.01	83.30
Germany	81.79	83.12	1.11	1.09	4 183.10	4 448.72	3.75	3.59	87.59	88.10
India	1 310.15	1 352.64	17.77	17.74	7 146.03	8 787.69	6.40	7.09	17.00	20.10 <sup>1</sup>
Indonesia	258.38	267.67	3.51	3.51	2 622.49	3 043.74	2.35	2.46	21.98	47.70
Iran	78.49	81.80	1.06	1.07	996.70	–	0.89	–	45.33	70.00 <sup>1</sup>
Israel	7.98	8.38	0.11	0.11	315.37	351.25	0.28	0.28	77.35	86.80
Italy	60.58	60.63	0.82	0.80	2 456.24	2 549.69	2.20	2.06	58.14	74.39 <sup>1</sup>
Japan	127.99	127.20	1.74	1.67	5 044.06	5 197.07	4.52	4.19	91.06	91.28 <sup>1</sup>
Korea, Rep.	50.82	51.17	0.69	0.67	1 982.96	2 162.01	1.78	1.74	89.90	96.20
Malaysia	30.27	31.53	0.41	0.41	750.49	868.20	0.67	0.70	71.06	84.20
Mexico	121.86	126.19	1.65	1.66	2 350.43	2 522.84	2.11	2.04	57.43	70.10
Russian Federation	144.99	145.73	1.97	1.91	3 743.06	3 915.64	3.35	3.16	70.10	82.60
Saudi Arabia	31.72	33.70	0.43	0.44	1 551.67	1 604.01	1.39	1.29	69.62	95.70
South Africa	55.39	57.79	0.75	0.76	711.16	729.80	0.64	0.59	51.92	56.17 <sup>2</sup>
Turkey	78.53	82.34	1.07	1.08	2 042.98	2 329.55	1.83	1.88	53.74	74.00
UK	65.86	67.14	0.89	0.88	2 924.55	3 077.77	2.62	2.48	92.00	92.50
USA	320.88	327.10	4.35	4.29	18 768.63	20 105.79	16.82	16.22	74.55	88.50 <sup>1</sup>

Note: Eastern Europe refers to those countries that are not members of the European Union. Global and regional estimates are derived from national data without extrapolation to other countries. OECD stands for the Organisation for Economic Co-operation and Development.

Source: World Bank's World Development Indicators, August 2020

Table 1.2: Global trends in research expenditure, 2014 and 2018

	Gross domestic expenditure on R&D (GERD) [PPP\$ billions]			Share of global GERD (%)		GERD as share of GDP (%)		GERD per capita (PPP\$)			GERD per researcher (FTE) [PPP\$ thousands]		
	2014	2018	Change (%)	2014	2018	2014	2018	2014	2018	Change (%)	2014	2018	Change (%)
<b>World</b>	<b>1 482.68</b>	<b>1 767.27</b>	<b>19.19</b>	<b>100.00</b>	<b>100.00</b>	<b>1.73</b>	<b>1.79</b>	<b>236.16</b>	<b>269.52</b>	<b>14.13</b>	<b>164.40</b>	<b>166.96</b>	<b>1.56</b>
High-income	1 011.23	1 137.40	12.48	68.20	64.36	2.31	2.40	805.72	890.75	10.55	194.28	195.71	0.74
Upper middle-income	407.70	551.59	35.29	27.50	31.21	1.39	1.57	170.74	223.81	31.08	187.48	199.15	6.22
Lower middle-income	62.20	76.56	23.09	4.20	4.33	0.48	0.49	27.94	32.40	15.96	126.63	123.21	-2.70
Low-income	1.55	1.72	10.97	0.10	0.10	0.22	0.22	3.66	3.81	4.10	145.21	138.34	-4.73
<b>Americas</b>	<b>476.69</b>	<b>531.35</b>	<b>11.47</b>	<b>32.15</b>	<b>30.07</b>	<b>2.05</b>	<b>2.12</b>	<b>536.66</b>	<b>576.51</b>	<b>7.43</b>	<b>245.02</b>	<b>230.33</b>	<b>-6.00</b>
North America	425.21	483.43	13.69	28.68	27.35	2.63	2.73	1 200.02	1 327.48	10.62	284.19	295.60	4.01
Latin America	51.44	47.89	-6.90	3.47	2.71	0.73	0.66	96.60	86.72	-10.23	217.39	184.61	-15.08
Caribbean	0.03	0.03	0.00	0.00	0.00	0.08	0.09	22.75	23.52	3.38	44.57	45.47	2.02
<b>Europe</b>	<b>345.51</b>	<b>390.28</b>	<b>12.96</b>	<b>23.30</b>	<b>22.08</b>	<b>1.72</b>	<b>1.78</b>	<b>423.13</b>	<b>472.56</b>	<b>11.68</b>	<b>125.38</b>	<b>124.80</b>	<b>-0.46</b>
European Union	290.35	330.83	13.94	19.58	18.72	1.94	2.02	572.19	646.65	13.01	153.86	150.40	-2.25
Southeast Europe	0.82	1.05	28.05	0.06	0.06	0.57	0.65	64.57	86.45	33.89	55.69	54.72	-1.74
European Free Trade Assoc.	16.63	18.82	13.17	1.12	1.07	2.65	2.87	1 208.43	1 317.70	9.04	225.11	230.21	2.27
Eastern Europe	37.70	39.57	4.96	2.54	2.24	0.97	0.95	134.43	138.96	3.37	70.91	73.66	3.88
<b>Africa</b>	<b>14.90</b>	<b>17.85</b>	<b>19.80</b>	<b>1.01</b>	<b>1.01</b>	<b>0.54</b>	<b>0.59</b>	<b>24.93</b>	<b>26.82</b>	<b>7.58</b>	<b>137.19</b>	<b>141.05</b>	<b>2.81</b>
Sub-Saharan Africa	6.51	7.34	12.75	0.44	0.42	0.49	0.51	14.36	14.49	0.91	156.79	147.32	-6.04
Arab States in Africa	8.39	10.51	25.27	0.57	0.59	0.59	0.65	57.51	67.48	17.34	78.35	92.60	18.19
<b>Asia</b>	<b>627.58</b>	<b>808.05</b>	<b>28.76</b>	<b>42.33</b>	<b>45.72</b>	<b>1.62</b>	<b>1.70</b>	<b>159.01</b>	<b>196.99</b>	<b>23.89</b>	<b>159.28</b>	<b>167.32</b>	<b>5.05</b>
Central Asia	0.95	0.81	-14.74	0.06	0.05	0.17	0.12	14.72	11.72	-20.38	25.83	24.44	-5.38
Arab States in Asia	6.94	10.17	46.54	0.47	0.58	0.40	0.53	106.66	143.09	34.16	176.41	144.28	-18.21
West Asia	15.54	26.05	67.63	1.05	1.47	0.94	1.37	150.77	242.22	60.66	71.18	93.41	31.23
South Asia	45.61	56.49	23.85	3.08	3.20	0.64	0.60	30.18	35.59	17.93	144.92	140.30	-3.19
East & Southeast Asia	558.54	714.52	27.93	37.67	40.43	2.03	2.13	253.47	315.45	24.45	174.77	193.03	10.45
<b>Oceania</b>	<b>18.01</b>	<b>19.75</b>	<b>9.66</b>	<b>1.21</b>	<b>1.12</b>	<b>1.74</b>	<b>1.81</b>	<b>496.95</b>	<b>514.61</b>	<b>3.55</b>	<b>42.05</b>	<b>46.90</b>	<b>11.53</b>
<b>Other groupings</b>													
Least developed	1.80	2.03	12.78	0.12	0.11	0.19	0.21	3.89	4.08	4.88	137.35	132.04	-3.87
All Arab States	15.33	20.69	34.96	1.03	1.17	0.48	0.59	72.61	91.15	25.53	109.07	109.09	0.02
OECD	988.49	1 114.38	12.74	66.67	63.06	2.36	2.43	779.71	859.34	10.21	206.90	204.27	-1.27
G20	1 393.89	1 647.65	18.21	94.01	93.23	1.93	1.99	299.38	343.87	14.86	182.53	188.45	3.24
Org. Islamic Co-op.	48.73	69.04	41.68	3.29	3.91	0.45	0.60	45.96	59.20	28.81	92.17	89.86	-2.51
<b>Selected countries</b>													
Argentina	4.28	4.03 <sup>-1</sup>	-5.84	0.29	0.23 <sup>-1</sup>	0.59	0.54 <sup>-1</sup>	100.28	91.63 <sup>-1</sup>	-8.63	83.09	76.86 <sup>-1</sup>	-7.50
Australia	-	17.30	-	-	0.98 <sup>-1</sup>	-	1.87 <sup>-1</sup>	-	703.57 <sup>-1</sup>	-	-	-	-
Brazil	35.56	33.30	-6.36	2.40	1.88 <sup>-1</sup>	1.27	1.26 <sup>-1</sup>	175.35	160.23 <sup>-1</sup>	-8.62	197.54	-	-
Canada	23.47	22.85 <sup>-1</sup>	-2.64	1.58	1.29	1.72	1.57	658.16	616.40	-6.34	144.91	150.68 <sup>-1</sup>	3.98
China	313.94	439.02	39.84	21.18	24.84	2.03	2.19	224.33	307.51	37.08	205.96	235.26	14.23
Egypt	5.14	6.99	35.99	0.35	0.40	0.64	0.72	56.89	71.03	24.85	84.26	103.44	22.76
France	47.55	48.88	2.80	3.21	2.77	2.28	2.20	740.75	752.06	1.53	174.97	159.49	-8.85
Germany	85.96	99.99	16.32	5.80	5.66	2.87	3.09	1 055.35	1 202.88	13.98	244.26	230.80	-5.51
India	43.55	54.04	24.09	2.94	3.06	0.70	0.65	33.62	39.95	18.83	-	158.11	-
Indonesia	-	6.26	-	-	0.35	-	0.23	-	23.40	-	-	108.36	-
Iran	-	11.40 <sup>-1</sup>	-	-	0.64 <sup>-1</sup>	-	0.83 <sup>-1</sup>	-	141.28 <sup>-1</sup>	-	-	95.79 <sup>-1</sup>	-
Israel	10.19	13.81	35.53	0.69	0.78	4.17	4.95	1 297.90	1 647.67	26.95	-	-	-
Italy	22.15	24.15	9.03	1.49	1.37	1.34	1.40	366.62	398.30	8.64	187.40	172.67	-7.86
Japan	143.48	144.12	0.45	9.68	8.16	3.40	3.26	1 119.47	1 133.01	1.21	210.10	212.53	1.16
Korea, Rep.	68.98	86.62	25.57	4.65	4.90	4.29	4.53	1 363.09	1 692.64	24.18	199.68	212.10	6.22
Malaysia	8.23	-	-	0.56	-	1.26	-	275.50	-	-	134.12	-	-
Mexico	7.04	5.59	-20.60	0.47	0.32	0.44	0.31	58.50	44.27	-24.32	224.85	-	-
Russian Fed.	24.00	22.57	-5.96	1.62	1.28	1.07	0.99	165.89	154.88	-6.64	53.94	55.62	3.11
South Africa	4.64	5.16 <sup>-1</sup>	11.21	0.31	0.29 <sup>-1</sup>	0.77	0.83 <sup>-1</sup>	85.12	90.55 <sup>-1</sup>	6.38	196.96	174.89 <sup>-1</sup>	-11.21
Turkey	10.83	14.22 <sup>-1</sup>	31.30	0.73	0.80 <sup>-1</sup>	0.86	0.96 <sup>-1</sup>	140.19	175.26 <sup>-1</sup>	25.02	120.76	127.05 <sup>-1</sup>	5.21
UK	36.00	40.24	11.78	2.43	2.28	1.66	1.72	550.28	599.32	8.91	130.16	130.19	0.02
USA	401.74	460.58 <sup>-1</sup>	14.65	27.10	26.06 <sup>-1</sup>	2.72	2.84 <sup>-1</sup>	1 260.66	1408.08 <sup>-1</sup>	11.69	299.78	309.94 <sup>-1</sup>	3.39

Note: GERD figures are in PPP\$ (constant 2005 prices). Many of the underlying data are estimated by the UNESCO Institute for Statistics for developing countries, in particular. Furthermore, in a substantial number of developing countries data do not cover all sectors of the economy.

Source: global and regional estimates based on country-level data from the UNESCO Institute for Statistics, August 2020, without extrapolation

Table 1.3: Global trends in research personnel, 2014 and 2018

	Researchers (FTE, thousands)			Share of global researchers (%)		Females, in head counts (%)	Researchers per million inhabitants (FTE)			Technicians per million inhabitants (FTE)		
	2014	2018	Change (%)	2014	2018	2018	2014	2018	Change (%)	2014	2018	Change (%)
<b>World</b>	<b>7 789.79</b>	<b>8 854.29</b>	<b>13.67</b>	<b>100.00</b>	<b>100.00</b>	<b>33.25</b>	<b>1 245.3</b>	<b>1 368.0</b>	<b>9.86</b>	<b>301.7</b>	<b>311.3</b>	<b>3.18</b>
High-income	4 885.91	5 333.83	9.17	62.72	60.24	29.59	3 994.7	4 301.1	7.67	1 021.7	1 047.1	2.49
Upper middle-income	2 256.87	2 762.41	22.40	28.97	31.20	42.65	955.0	1 141.1	19.49	358.1	425.3	18.77
Lower middle-income	633.92	739.42	16.64	8.14	8.35	42.79	275.8	312.2	13.20	83.5	73.8	-11.62
Low-income	13.09	18.64	42.37	0.17	0.21	19.54	33.1	45.1	36.13	20.1	22.7	12.94
<b>Americas</b>	<b>1 797.28</b>	<b>1 918.33</b>	<b>6.74</b>	<b>23.07</b>	<b>21.67</b>	<b>49.80</b>	<b>2 046.7</b>	<b>2 131.6</b>	<b>4.15</b>	<b>33.1</b>	<b>45.1</b>	<b>36.25</b>
North America	1 502.09	1 603.66	6.76	19.28	18.11	–	4 239.1	4 432.2	107.72	1 353.0	1 280.2	-5.38
Latin America	294.49	313.95	6.61	3.78	3.55	49.77	563.7	592.9	5.19	531.2	556.6	4.78
Caribbean	0.70	0.72	2.02	0.01	0.01	50.24	509.2	519.5	2.02	273.8	268.4	-1.97
<b>Europe</b>	<b>2 446.37</b>	<b>2 746.56</b>	<b>12.27</b>	<b>31.40</b>	<b>31.02</b>	<b>34.85</b>	<b>3 034.4</b>	<b>3 372.0</b>	<b>11.12</b>	<b>930.4</b>	<b>977.0</b>	<b>5.01</b>
European Union	1 772.36	2 081.75	17.46	22.75	23.51	33.78	3 492.9	4 069.2	16.50	1 336.2	1 413.6	5.79
Southeast Europe	16.21	18.23	12.47	0.21	0.21	51.21	1 290.8	1 487.2	15.21	236.7	275.3	16.31
European Free Trade Assoc.	74.43	83.05	11.58	0.96	0.94	36.59	5 406.9	5 876.6	8.69	2 525.0	2 631.7	4.23
Eastern Europe	583.37	563.53	-3.40	7.49	6.36	39.04	2 153.5	2 053.8	-4.63	357.1	362.8	1.60
<b>Africa</b>	<b>194.59</b>	<b>221.28</b>	<b>13.72</b>	<b>2.50</b>	<b>2.50</b>	<b>41.82</b>	<b>307.9</b>	<b>326.4</b>	<b>6.01</b>	<b>86.0</b>	<b>93.3</b>	<b>8.49</b>
Sub-Saharan Africa	46.54	59.93	28.77	0.60	0.68	33.48	102.3	123.8	20.97	36.4	38.5	5.77
Arab States in Africa	148.05	161.36	8.99	1.90	1.82	44.87	837.0	866.2	3.49	202.7	214.5	5.82
<b>Asia</b>	<b>3 326.52</b>	<b>3 941.58</b>	<b>18.49</b>	<b>42.70</b>	<b>44.52</b>	<b>28.43</b>	<b>845.0</b>	<b>969.9</b>	<b>14.79</b>	<b>130.2</b>	<b>133.6</b>	<b>2.61</b>
Central Asia	29.07	27.68	-4.77	0.37	0.31	44.90	609.1	545.0	-10.52	104.0	75.4	-27.50
Arab States in Asia	29.53	40.33	36.58	0.38	0.46	34.17	354.7	458.2	29.18	148.8	149.3	0.34
West Asia	68.21	126.51	85.48	0.88	1.43	33.95	826.6	1 494.0	80.74	160.1	491.5	207.00
South Asia	336.37	415.29	23.46	4.32	4.69	39.14	219.7	262.8	19.61	86.0	67.7	-21.28
East & Southeast Asia	2 863.35	3 331.77	16.36	36.76	37.63	26.31	1 297.9	1 475.6	13.70	209.8	224.1	6.82
<b>Oceania</b>	<b>25.03</b>	<b>26.53</b>	<b>6.01</b>	<b>0.32</b>	<b>0.30</b>	<b>33.25</b>	<b>1 978.9</b>	<b>2 005.6</b>	<b>1.35</b>	<b>382.4</b>	<b>464.6</b>	<b>21.50</b>
<b>Other groupings</b>												
Least developed	21.65	28.21	30.35	0.28	0.32	21.98	49.1	62	26.27	20.6	23.3	13.11
All Arab States	177.58	201.69	13.58	2.28	2.28	42.60	681.9	736	7.93	185.4	193.7	4.48
OECD	4 478.64	4 987.73	11.37	57.49	56.33	28.96	3 622.6	3 959	9.29	926.9	976.2	5.32
G20	6 973.47	7 865.54	12.79	89.52	88.83	30.82	1 504.3	1 654	9.95	405.0	406.8	0.44
Org. Islamic Co-op.	533.53	681.62	27.76	6.85	7.70	40.17	499.5	609	21.93	94.1	140.9	49.73
<b>Selected countries</b>												
Argentina	51.46	52.4 <sup>-1</sup>	1.79	0.66	0.59 <sup>-1</sup>	54.07 <sup>-1</sup>	1 206.9	1 192.23 <sup>-1</sup>	-1.22	318.8	398.1	24.87
Brazil	179.99	–	–	2.31	–	–	887.7	–	–	969.9	–	–
Canada	161.98	158.89 <sup>-1</sup>	-1.91	2.08	1.80 <sup>-1</sup>	–	4 541.9	4 325.64 <sup>-1</sup>	-4.76	1 353.0	1 268.4 <sup>-1</sup>	-6.25
China	1 524.28	1 866.11	22.43	19.55	21.12	–	1 089.2	1 307.12	20.01	–	–	–
Egypt	61.06	67.59	10.70	0.78	0.76	45.6	675.2	686.72	1.70	351.6	369.6	5.12
France	271.77	306.45	12.76	3.49	3.47	28.3 <sup>-1</sup>	4 233.6	4 715.32	11.38	1 809.3	1 805.5 <sup>-1</sup>	-0.21
Germany	351.92	433.23	23.10	4.51	4.90	27.9 <sup>-1</sup>	4 320.7	5 211.87	20.63	1 883.2	2 018.0	7.16
India	–	341.82	–	–	3.87	–	–	252.70	–	95.5	73.1	-23.46
Indonesia	–	57.82	–	–	0.65	45.8	–	215.99	–	16.3 <sup>-2</sup>	34.7	112.88
Iran	–	118.99 <sup>-1</sup>	–	–	1.35 <sup>-1</sup>	31.2 <sup>-1</sup>	–	1 474.91 <sup>-1</sup>	–	160.6 <sup>-1</sup>	496.8 <sup>-1</sup>	209.34
Italy	118.18	139.85	18.34	1.52	1.58	34.3 <sup>-1</sup>	1 956.4	2 306.77	17.91	–	–	–
Japan	682.94	678.13	-0.70	8.76	7.67	16.6	5 328.4	5 331.15	0.05	537.0	524.3	-2.36
Korea, Rep.	345.46	408.37	18.21	4.43	4.62	20.4	6 826.3	7 980.40	16.91	1 228.2	1 251.1	1.86
Malaysia	61.35	–	–	0.79	–	48.2 <sup>-2</sup>	2 054.2	–	–	212.2	233.4	9.99
Mexico	31.32	–	–	0.40	–	–	260.2	–	–	115.6	140.3 <sup>-2</sup>	21.37
Russian Fed.	444.87	405.77	-8.79	5.71	4.59	39.2	3 075.1	2 784.33	-9.46	496.6	437.8	-11.84
South Africa	23.57	29.52 <sup>-1</sup>	25.21	0.30	0.33 <sup>-1</sup>	44.9 <sup>-1</sup>	432.2	517.72 <sup>-1</sup>	19.80	141.7	129.5 <sup>-1</sup>	-8.61
Turkey	89.66	111.89 <sup>-1</sup>	24.80	1.15	1.27 <sup>-1</sup>	37.0 <sup>-1</sup>	1 160.9	1 379.41 <sup>-1</sup>	18.82	208.3	353.7 <sup>-1</sup>	69.80
UK	276.58	309.07	11.75	3.55	3.50	38.7 <sup>-2</sup>	4 227.6	4 603.31	8.89	1 255.5	1 305.4 <sup>-2</sup>	3.97
USA	1 340.10	1 434.42 <sup>-1</sup>	7.04	17.19	16.23 <sup>-1</sup>	–	4 205.3	4 412.44 <sup>-1</sup>	4.93	–	–	–

Note: Researchers are counted in full-time equivalents (FTE). Global and regional estimates are based on the available FTE data for the countries. The share of female researchers is based on available head count data for the most recent year between 2015 and 2018. See Table 1.1 for regional terms.

Source: global and regional estimates based on country-level data from the UNESCO Institute for Statistics, August 2020, without extrapolation



**Table 1.5: Global trends in scientific publications on selected cross-cutting strategic technologies, 2015 and 2019**

	Volume											
	AI & robotics		Biotechnology		Energy		Materials		Nanoscience & nanotech		Opto-electronics	
	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019
<b>World</b>	<b>102 347</b>	<b>147 806</b>	<b>16 707</b>	<b>18 714</b>	<b>86 771</b>	<b>108 129</b>	<b>63 705</b>	<b>93 033</b>	<b>31 226</b>	<b>46 121</b>	<b>29 517</b>	<b>26 651</b>
High-income	65 365	74 661	9 869	9 394	49 997	57 245	31 625	40 729	21 104	27 979	18 560	15 330
Upper middle-income	33 075	50 340	6 531	9 333	36 903	53 560	32 529	48 484	13 290	24 657	11 813	11 872
Lower middle-income	13 052	37 389	2 283	2 937	7 890	12 701	6 097	15 194	2 035	3 588	1 293	1 816
Low-income	280	1 037	79	120	249	607	89	284	33	103	31	67
<b>Americas</b>	<b>20 633</b>	<b>24 969</b>	<b>3 934</b>	<b>4 161</b>	<b>19 674</b>	<b>21 445</b>	<b>9 471</b>	<b>10 588</b>	<b>8 457</b>	<b>11 053</b>	<b>7 623</b>	<b>5 964</b>
North America	16 628	18 727	2 876	2 603	16 859	17 434	7 623	8 088	8 075	10 514	6 901	5 354
Latin America	4 211	6 524	1 122	1 651	3 152	4 394	1 974	2 661	478	670	800	655
Caribbean	92	144	36	20	53	60	26	44	6	6	4	5
<b>Europe</b>	<b>40 993</b>	<b>47 402</b>	<b>4 883</b>	<b>4 984</b>	<b>26 524</b>	<b>31 950</b>	<b>19 124</b>	<b>28 125</b>	<b>8 181</b>	<b>11 040</b>	<b>9 781</b>	<b>8 299</b>
European Union	36 554	37 207	4 284	4 246	21 637	25 662	14 797	17 913	7 355	9 717	8 244	6 178
Southeast Europe	382	336	79	86	325	313	201	302	41	37	37	30
European Free Trade Assoc.	1 851	2 034	191	215	1 635	1 837	680	804	589	861	382	334
Eastern Europe	3 624	9 658	528	666	4 004	5 586	4 423	10 466	767	1 280	1 580	2 283
Africa	3 207	4 752	551	844	2 710	4 443	1 185	2 451	400	604	310	445
Sub-Saharan Africa	823	1 539	221	383	1 169	2 018	334	965	91	168	61	125
Arab States in Africa	2 389	3 225	334	467	1 563	2 450	862	1 505	311	441	254	330
<b>Asia</b>	<b>46 913</b>	<b>84 072</b>	<b>9 285</b>	<b>11 355</b>	<b>45 754</b>	<b>64 150</b>	<b>39 692</b>	<b>60 953</b>	<b>19 968</b>	<b>32 818</b>	<b>14 800</b>	<b>14 896</b>
Central Asia	142	569	15	11	194	317	102	304	6	80	62	149
Arab States in Asia	1 908	3 936	286	458	2 466	4 125	883	2 050	719	1 008	283	294
Southeast Asia	33 662	50 330	6 854	8 491	36 498	50 194	33 248	49 993	17 598	28 957	13 139	13 030
South Asia	9 956	29 049	1 896	2 179	5 045	7 976	4 599	7 961	1 566	2 875	837	1 118
West Asia	2 173	2 402	473	657	2 579	3 744	1 667	2 250	612	927	648	565
<b>Oceania</b>	<b>2 918</b>	<b>3 469</b>	<b>368</b>	<b>412</b>	<b>2 198</b>	<b>3 066</b>	<b>1 328</b>	<b>1 671</b>	<b>1 078</b>	<b>1 809</b>	<b>466</b>	<b>308</b>
<b>Other groupings</b>												
Least developed countries	325	1 126	82	132	289	630	95	295	32	111	33	67
All Arab States	4 091	6 868	558	833	3 785	6 187	1 581	3 219	886	1 340	498	577
OECD	60 878	66 911	9 396	9 105	45 852	51 576	28 260	32 085	18 834	24 861	16 979	13 274
G20	91 303	128 003	15 220	16 808	76 010	96 361	58 375	84 400	28 953	43 399	27 521	25 161
Org. Islamic Co-op.	9 685	20 149	1 759	2 604	11 790	15 537	5 659	13 942	1 740	2 767	1 426	1 585
<b>Selected countries</b>												
Argentina	218	250	116	120	205	336	162	179	59	64	32	20
Australia	2 520	3 003	325	342	2 077	2 840	1 202	1 541	1 045	1 743	432	286
Brazil	2 037	2 640	684	1 032	1 641	2 181	1 331	1 654	256	293	405	341
Canada	2 792	3 217	413	431	2 752	2 937	1 111	1 227	794	1 143	780	630
China	20 414	29 766	3 891	5 608	24 352	38 521	24 863	35 942	11 554	22 270	9 559	10 010
Egypt	610	837	166	302	760	1 247	404	784	236	279	132	201
France	5 215	4 536	512	461	2 755	2 667	2 031	1 900	1 170	1 350	1 374	945
Germany	6 712	6 726	827	776	3 950	4 305	3 262	3 441	1 949	2 684	1 995	1 507
India	9 276	26 779	1 770	1 918	4 562	6 609	4 152	7 257	1 433	2 550	717	969
Indonesia	822	3 229	57	138	670	1 098	166	4 264	16	86	42	182
Iran	1 357	1 613	406	590	2 366	3 463	1 514	1 952	369	548	312	314
Israel	745	638	59	56	165	196	122	216	236	361	308	215
Italy	4 380	4 773	496	436	3 429	3 683	1 242	1 651	953	1 128	959	664
Japan	4 891	5 917	973	953	3 778	3 293	3 481	3 295	1 841	2 225	1 847	1 603
Korea, Rep.	2 426	3 029	1 304	1 108	2 900	3 786	2 510	3 009	2 630	3 452	645	592
Malaysia	1 685	4 404	357	446	3 550	1 821	1 137	2 598	258	307	236	138
Mexico	969	1 228	204	324	605	761	362	505	120	218	234	213
Russian Fed.	1 986	5 704	254	273	2 527	3 259	2 949	8 357	455	903	1 161	1 898
Saudi Arabia	927	1 265	192	195	1 075	1 662	519	849	584	639	159	146
South Africa	511	701	85	145	529	959	214	441	72	84	40	93
Turkey	1 094	2 073	247	355	943	1 544	929	1 242	181	240	224	159
UK	5 700	6 192	472	578	3 903	4 947	2 166	2 458	1 488	2 072	1 410	950
USA	14 149	15 893	2 526	2 231	14 435	14 862	6 636	7 001	7 419	9 614	6 251	4 841

Note: The sum of the numbers for the various regions exceeds the total number because papers with multiple authors from different regions are counted for each of these regions. The six cross-cutting technologies featured here were followed by bioinformatics, Internet of Things, strategic, defence and security studies and blockchain technology. See Table 1.1 for regional terms.

	Global share (%)											
	AI & robotics		Biotechnology		Energy		Materials		Nanoscience & nanotech		Opto-electronics	
	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019
<b>World</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
High-income	63.87	50.51	59.07	50.20	57.62	52.94	49.64	43.78	67.58	60.66	62.88	57.52
Upper middle-income	32.32	34.06	39.09	49.87	42.53	49.53	51.06	52.11	42.56	53.46	40.02	44.55
Lower middle-income	12.75	25.30	13.66	15.69	9.09	11.75	9.57	16.33	6.52	7.78	4.38	6.81
Low-income	0.27	0.70	0.47	0.64	0.29	0.56	0.14	0.31	0.11	0.22	0.11	0.25
<b>Americas</b>	<b>20.16</b>	<b>16.89</b>	<b>23.55</b>	<b>22.23</b>	<b>22.67</b>	<b>19.83</b>	<b>14.87</b>	<b>11.38</b>	<b>27.08</b>	<b>23.97</b>	<b>25.83</b>	<b>22.38</b>
North America	16.25	12.67	17.21	13.91	19.43	16.12	11.97	8.69	25.86	22.80	23.38	20.09
Latin America	4.11	4.41	6.72	8.82	3.63	4.06	3.10	2.86	1.53	1.45	2.71	2.46
Caribbean	0.09	0.10	0.22	0.11	0.06	0.06	0.04	0.05	0.02	0.01	0.01	0.02
<b>Europe</b>	<b>40.05</b>	<b>32.07</b>	<b>29.23</b>	<b>26.63</b>	<b>30.57</b>	<b>29.55</b>	<b>30.02</b>	<b>30.23</b>	<b>26.20</b>	<b>23.94</b>	<b>33.14</b>	<b>31.14</b>
European Union	35.72	25.17	25.64	22.69	24.94	23.73	23.23	19.25	23.55	21.07	27.93	23.18
Southeast Europe	0.37	0.23	0.47	0.46	0.37	0.29	0.32	0.32	0.13	0.08	0.13	0.11
European Free Trade Assoc.	1.81	1.38	1.14	1.15	1.88	1.70	1.07	0.86	1.89	1.87	1.29	1.25
Eastern Europe	3.54	6.53	3.16	3.56	4.61	5.17	6.94	11.25	2.46	2.78	5.35	8.57
<b>Africa</b>	<b>3.13</b>	<b>3.22</b>	<b>3.30</b>	<b>4.51</b>	<b>3.12</b>	<b>4.11</b>	<b>1.86</b>	<b>2.63</b>	<b>1.28</b>	<b>1.31</b>	<b>1.05</b>	<b>1.67</b>
Sub-Saharan Africa	0.80	1.04	1.32	2.05	1.35	1.87	0.52	1.04	0.29	0.36	0.21	0.47
Arab States in Africa	2.33	2.18	2.00	2.50	1.80	2.27	1.35	1.62	1.00	0.96	0.86	1.24
<b>Asia</b>	<b>45.84</b>	<b>56.88</b>	<b>55.58</b>	<b>60.68</b>	<b>52.73</b>	<b>59.33</b>	<b>62.31</b>	<b>65.52</b>	<b>63.95</b>	<b>71.16</b>	<b>50.14</b>	<b>55.89</b>
Central Asia	0.14	0.38	0.09	0.06	0.22	0.29	0.16	0.33	0.02	0.17	0.21	0.56
Arab States in Asia	1.86	2.66	1.71	2.45	2.84	3.81	1.39	2.20	2.30	2.19	0.96	1.10
Southeast Asia	32.89	34.05	41.02	45.37	42.06	46.42	52.19	53.74	56.36	62.78	44.51	48.89
South Asia	9.73	19.65	11.35	11.64	5.81	7.38	7.22	8.56	5.02	6.23	2.84	4.19
West Asia	2.12	1.63	2.83	3.51	2.97	3.46	2.62	2.42	1.96	2.01	2.20	2.12
<b>Oceania</b>	<b>2.85</b>	<b>2.35</b>	<b>2.20</b>	<b>2.20</b>	<b>2.53</b>	<b>2.84</b>	<b>2.08</b>	<b>1.80</b>	<b>3.45</b>	<b>3.92</b>	<b>1.58</b>	<b>1.16</b>
<b>Other groupings</b>												
Least developed countries	0.32	0.76	0.49	0.71	0.33	0.58	0.15	0.32	0.10	0.24	0.11	0.25
All Arab States	4.00	4.65	3.34	4.45	4.36	5.72	2.48	3.46	2.84	2.91	1.69	2.17
OECD	59.48	45.27	56.24	48.65	52.84	47.70	44.36	34.49	60.32	53.90	57.52	49.81
G20	89.21	86.60	91.10	89.82	87.60	89.12	91.63	90.72	92.72	94.10	93.24	94.41
Org. Islamic Co-op.	9.46	13.63	10.53	13.91	13.59	14.37	8.88	14.99	5.57	6.00	4.83	5.95
<b>Selected countries</b>												
Argentina	0.21	0.17	0.69	0.64	0.24	0.31	0.25	0.19	0.19	0.14	0.11	0.08
Australia	2.46	2.03	1.95	1.83	2.39	2.63	1.89	1.66	3.35	3.78	1.46	1.07
Brazil	1.99	1.79	4.09	5.51	1.89	2.02	2.09	1.78	0.82	0.64	1.37	1.28
Canada	2.73	2.18	2.47	2.30	3.17	2.72	1.74	1.32	2.54	2.48	2.64	2.36
China	19.95	20.14	23.29	29.97	28.06	35.63	39.03	38.63	37.00	48.29	32.38	37.56
Egypt	0.60	0.57	0.99	1.61	0.88	1.15	0.63	0.84	0.76	0.60	0.45	0.75
France	5.10	3.07	3.06	2.46	3.18	2.47	3.19	2.04	3.75	2.93	4.65	3.55
Germany	6.56	4.55	4.95	4.15	4.55	3.98	5.12	3.70	6.24	5.82	6.76	5.65
India	9.06	18.12	10.59	10.25	5.26	6.11	6.52	7.80	4.59	5.53	2.43	3.64
Indonesia	0.80	2.18	0.34	0.74	0.77	1.02	0.26	4.58	0.05	0.19	0.14	0.68
Iran	1.33	1.09	2.43	3.15	2.73	3.20	2.38	2.10	1.18	1.19	1.06	1.18
Israel	0.73	0.43	0.35	0.30	0.19	0.18	0.19	0.23	0.76	0.78	1.04	0.81
Italy	4.28	3.23	2.97	2.33	3.95	3.41	1.95	1.77	3.05	2.45	3.25	2.49
Japan	4.78	4.00	5.82	5.09	4.35	3.05	5.46	3.54	5.90	4.82	6.26	6.01
Korea, Rep.	2.37	2.05	7.81	5.92	3.34	3.50	3.94	3.23	8.42	7.48	2.19	2.22
Malaysia	1.65	2.98	2.14	2.38	4.09	1.68	1.78	2.79	0.83	0.67	0.80	0.52
Mexico	0.95	0.83	1.22	1.73	0.70	0.70	0.57	0.54	0.38	0.47	0.79	0.80
Russian Fed.	1.94	3.86	1.52	1.46	2.91	3.01	4.63	8.98	1.46	1.96	3.93	7.12
Saudi Arabia	0.91	0.86	1.15	1.04	1.24	1.54	0.81	0.91	1.87	1.39	0.54	0.55
South Africa	0.50	0.47	0.51	0.77	0.61	0.89	0.34	0.47	0.23	0.18	0.14	0.35
Turkey	1.07	1.40	1.48	1.90	1.09	1.43	1.46	1.34	0.58	0.52	0.76	0.60
UK	5.57	4.19	2.83	3.09	4.50	4.58	3.40	2.64	4.77	4.49	4.78	3.56
USA	13.82	10.75	15.12	11.92	16.64	13.74	10.42	7.53	23.76	20.85	21.18	18.16

Source: Scopus (Elsevier), excluding Arts, Humanities and Social sciences; data treatment by Science-Matrix