

## Fossil fuel consumption and cement manufacturing carbon emissions from 1751 to 2014

Based on CDIAC / Boden, Marland, & Andres  
Data through 2013, and forecast for 2014  
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14-Dec-14

**CMS note, 28Jan08:**  
CDIAC database of emissions through 2004 also updated totals, liquids, and solids back to 1966; including significant changes 1980-2004, which also shows much higher flaring estimates.

**CMS note, 3Feb09**  
Updated several annual stats 1980-2005. Pre-1980 appears unchanged.  
[http://cdiac.ornl.gov/ftp/ndp030/global.1751\\_2005.ems](http://cdiac.ornl.gov/ftp/ndp030/global.1751_2005.ems)

**CMS note, 2March2011**  
Updated another file with updated CDIAC data 1950-2007, and extrapolation to 2009

**CMS note, 17 November 2011**  
Updated all CDIAC 1751-2008 data, and preliminary 2009-2010

**CMS note, 26 November 2012**  
Revised data for 2009 (and several prior years) at right; NOT revised in tabulation below.

**CMS note, 22 September 2014**  
Added GCP/CDIAC data for 1959-2013 from Global Carbon Budget 2014 data set

**CMS note, 14 December 2014**  
Added Global Carbon Project for CO2 in 2013, plus forecast Friedlingstein for 2014.

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\*\*\* Global CO2 Emissions from Fossil-Fuel Burning, \*\*\*  
\*\*\* Cement Manufacture, and Gas Flaring: 1751-2014 \*\*\*  
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Data for 1751-1958: Boden, Marland, & Andres 2013; CDIAC (US DOE)

Data for 1959-2013: La Quere et al. 2014, Global Carbon Project

Forecast for 2014 for global CO2 from fossil fuel and cement: Friedlingstein et al.

**Table 1**

All emission estimates are expressed in million metric tonnes of carbon.

| Year | Total | Gas | Liquids | Solids | Cement Manufacture | Gas Flaring | Per Capita   | Year | Cumulative by year | Percent of 1751-2014 |
|------|-------|-----|---------|--------|--------------------|-------------|--------------|------|--------------------|----------------------|
|      | MtC   | MtC | MtC     | MtC    | MtC                | MtC         | tonnes C/cap |      |                    |                      |
| 1751 | 3     | -   | -       | 3      | -                  | -           | -            | 1751 | 3                  | 0.00%                |
| 1752 | 3     | -   | -       | 3      | -                  | -           | -            | 1752 | 6                  | 0.00%                |
| 1753 | 3     | -   | -       | 3      | -                  | -           | -            | 1753 | 9                  | 0.00%                |
| 1754 | 3     | -   | -       | 3      | -                  | -           | -            | 1754 | 12                 | 0.00%                |
| 1755 | 3     | -   | -       | 3      | -                  | -           | -            | 1755 | 15                 | 0.00%                |
| 1756 | 3     | -   | -       | 3      | -                  | -           | -            | 1756 | 18                 | 0.00%                |
| 1757 | 3     | -   | -       | 3      | -                  | -           | -            | 1757 | 21                 | 0.01%                |
| 1758 | 3     | -   | -       | 3      | -                  | -           | -            | 1758 | 24                 | 0.01%                |
| 1759 | 3     | -   | -       | 3      | -                  | -           | -            | 1759 | 27                 | 0.01%                |
| 1760 | 3     | -   | -       | 3      | -                  | -           | -            | 1760 | 30                 | 0.01%                |
| 1761 | 3     | -   | -       | 3      | -                  | -           | -            | 1761 | 33                 | 0.01%                |
| 1762 | 3     | -   | -       | 3      | -                  | -           | -            | 1762 | 36                 | 0.01%                |
| 1763 | 3     | -   | -       | 3      | -                  | -           | -            | 1763 | 39                 | 0.01%                |
| 1764 | 3     | -   | -       | 3      | -                  | -           | -            | 1764 | 42                 | 0.01%                |
| 1765 | 3     | -   | -       | 3      | -                  | -           | -            | 1765 | 45                 | 0.01%                |
| 1766 | 3     | -   | -       | 3      | -                  | -           | -            | 1766 | 48                 | 0.01%                |
| 1767 | 3     | -   | -       | 3      | -                  | -           | -            | 1767 | 51                 | 0.01%                |
| 1768 | 3     | -   | -       | 3      | -                  | -           | -            | 1768 | 54                 | 0.01%                |
| 1769 | 3     | -   | -       | 3      | -                  | -           | -            | 1769 | 57                 | 0.01%                |
| 1770 | 3     | -   | -       | 3      | -                  | -           | -            | 1770 | 60                 | 0.01%                |
| 1771 | 4     | -   | -       | 4      | -                  | -           | -            | 1771 | 64                 | 0.02%                |
| 1772 | 4     | -   | -       | 4      | -                  | -           | -            | 1772 | 68                 | 0.02%                |
| 1773 | 4     | -   | -       | 4      | -                  | -           | -            | 1773 | 72                 | 0.02%                |
| 1774 | 4     | -   | -       | 4      | -                  | -           | -            | 1774 | 76                 | 0.02%                |
| 1775 | 4     | -   | -       | 4      | -                  | -           | -            | 1775 | 80                 | 0.02%                |
| 1776 | 4     | -   | -       | 4      | -                  | -           | -            | 1776 | 84                 | 0.02%                |
| 1777 | 4     | -   | -       | 4      | -                  | -           | -            | 1777 | 88                 | 0.02%                |
| 1778 | 4     | -   | -       | 4      | -                  | -           | -            | 1778 | 92                 | 0.02%                |
| 1779 | 4     | -   | -       | 4      | -                  | -           | -            | 1779 | 96                 | 0.02%                |
| 1780 | 4     | -   | -       | 4      | -                  | -           | -            | 1780 | 100                | 0.02%                |
| 1781 | 5     | -   | -       | 5      | -                  | -           | -            | 1781 | 105                | 0.03%                |
| 1782 | 5     | -   | -       | 5      | -                  | -           | -            | 1782 | 110                | 0.03%                |
| 1783 | 5     | -   | -       | 5      | -                  | -           | -            | 1783 | 115                | 0.03%                |
| 1784 | 5     | -   | -       | 5      | -                  | -           | -            | 1784 | 120                | 0.03%                |
| 1785 | 5     | -   | -       | 5      | -                  | -           | -            | 1785 | 125                | 0.03%                |
| 1786 | 5     | -   | -       | 5      | -                  | -           | -            | 1786 | 130                | 0.03%                |
| 1787 | 5     | -   | -       | 5      | -                  | -           | -            | 1787 | 135                | 0.03%                |
| 1788 | 5     | -   | -       | 5      | -                  | -           | -            | 1788 | 140                | 0.03%                |
| 1789 | 5     | -   | -       | 5      | -                  | -           | -            | 1789 | 145                | 0.04%                |
| 1790 | 5     | -   | -       | 5      | -                  | -           | -            | 1790 | 150                | 0.04%                |
| 1791 | 6     | -   | -       | 6      | -                  | -           | -            | 1791 | 156                | 0.04%                |
| 1792 | 6     | -   | -       | 6      | -                  | -           | -            | 1792 | 162                | 0.04%                |
| 1793 | 6     | -   | -       | 6      | -                  | -           | -            | 1793 | 168                | 0.04%                |
| 1794 | 6     | -   | -       | 6      | -                  | -           | -            | 1794 | 174                | 0.04%                |
| 1795 | 6     | -   | -       | 6      | -                  | -           | -            | 1795 | 180                | 0.04%                |
| 1796 | 6     | -   | -       | 6      | -                  | -           | -            | 1796 | 186                | 0.05%                |
| 1797 | 7     | -   | -       | 7      | -                  | -           | -            | 1797 | 193                | 0.05%                |
| 1798 | 7     | -   | -       | 7      | -                  | -           | -            | 1798 | 200                | 0.05%                |
| 1799 | 7     | -   | -       | 7      | -                  | -           | -            | 1799 | 207                | 0.05%                |
| 1800 | 8     | -   | -       | 8      | -                  | -           | -            | 1800 | 215                | 0.05%                |
| 1801 | 8     | -   | -       | 8      | -                  | -           | -            | 1801 | 223                | 0.06%                |
| 1802 | 10    | -   | -       | 10     | -                  | -           | -            | 1802 | 233                | 0.06%                |
| 1803 | 9     | -   | -       | 9      | -                  | -           | -            | 1803 | 242                | 0.06%                |
| 1804 | 9     | -   | -       | 9      | -                  | -           | -            | 1804 | 251                | 0.06%                |
| 1805 | 9     | -   | -       | 9      | -                  | -           | -            | 1805 | 260                | 0.06%                |
| 1806 | 10    | -   | -       | 10     | -                  | -           | -            | 1806 | 270                | 0.07%                |
| 1807 | 10    | -   | -       | 10     | -                  | -           | -            | 1807 | 280                | 0.07%                |
| 1808 | 10    | -   | -       | 10     | -                  | -           | -            | 1808 | 290                | 0.07%                |
| 1809 | 10    | -   | -       | 10     | -                  | -           | -            | 1809 | 300                | 0.07%                |
| 1810 | 10    | -   | -       | 10     | -                  | -           | -            | 1810 | 310                | 0.08%                |
| 1811 | 11    | -   | -       | 11     | -                  | -           | -            | 1811 | 321                | 0.08%                |
| 1812 | 11    | -   | -       | 11     | -                  | -           | -            | 1812 | 332                | 0.08%                |
| 1813 | 11    | -   | -       | 11     | -                  | -           | -            | 1813 | 343                | 0.08%                |
| 1814 | 11    | -   | -       | 11     | -                  | -           | -            | 1814 | 354                | 0.09%                |
| 1815 | 12    | -   | -       | 12     | -                  | -           | -            | 1815 | 366                | 0.09%                |
| 1816 | 13    | -   | -       | 13     | -                  | -           | -            | 1816 | 379                | 0.09%                |
| 1817 | 14    | -   | -       | 14     | -                  | -           | -            | 1817 | 393                | 0.10%                |
| 1818 | 14    | -   | -       | 14     | -                  | -           | -            | 1818 | 407                | 0.10%                |
| 1819 | 14    | -   | -       | 14     | -                  | -           | -            | 1819 | 421                | 0.10%                |
| 1820 | 14    | -   | -       | 14     | -                  | -           | -            | 1820 | 435                | 0.11%                |
| 1821 | 14    | -   | -       | 14     | -                  | -           | -            | 1821 | 449                | 0.11%                |
| 1822 | 15    | -   | -       | 15     | -                  | -           | -            | 1822 | 464                | 0.11%                |
| 1823 | 16    | -   | -       | 16     | -                  | -           | -            | 1823 | 480                | 0.12%                |
| 1824 | 16    | -   | -       | 16     | -                  | -           | -            | 1824 | 496                | 0.12%                |
| 1825 | 17    | -   | -       | 17     | -                  | -           | -            | 1825 | 513                | 0.13%                |
| 1826 | 17    | -   | -       | 17     | -                  | -           | -            | 1826 | 530                | 0.13%                |
| 1827 | 18    | -   | -       | 18     | -                  | -           | -            | 1827 | 548                | 0.14%                |
| 1828 | 18    | -   | -       | 18     | -                  | -           | -            | 1828 | 566                | 0.14%                |
| 1829 | 18    | -   | -       | 18     | -                  | -           | -            | 1829 | 584                | 0.14%                |
| 1830 | 24    | -   | -       | 24     | -                  | -           | -            | 1830 | 608                | 0.15%                |
| 1831 | 23    | -   | -       | 23     | -                  | -           | -            | 1831 | 631                | 0.16%                |
| 1832 | 23    | -   | -       | 23     | -                  | -           | -            | 1832 | 654                | 0.16%                |
| 1833 | 24    | -   | -       | 24     | -                  | -           | -            | 1833 | 678                | 0.17%                |
| 1834 | 24    | -   | -       | 24     | -                  | -           | -            | 1834 | 702                | 0.17%                |
| 1835 | 25    | -   | -       | 25     | -                  | -           | -            | 1835 | 727                | 0.18%                |
| 1836 | 29    | -   | -       | 29     | -                  | -           | -            | 1836 | 756                | 0.19%                |
| 1837 | 29    | -   | -       | 29     | -                  | -           | -            | 1837 | 785                | 0.19%                |
| 1838 | 30    | -   | -       | 30     | -                  | -           | -            | 1838 | 815                | 0.20%                |
| 1839 | 31    | -   | -       | 31     | -                  | -           | -            | 1839 | 846                | 0.21%                |



| A   | B    | C | D      | E     | F     | G     | H   | I   | J             | K | L    | M | N       | O       | P | Q |
|-----|------|---|--------|-------|-------|-------|-----|-----|---------------|---|------|---|---------|---------|---|---|
| 240 | 1959 |   | 2,454  | 206   | 789   | 1,382 | 40  | 36  | 0.83          |   | 1959 |   | 80,866  | 20.03%  |   |   |
| 241 | 1960 |   | 2,569  | 227   | 849   | 1,410 | 43  | 39  | 0.85          |   | 1960 |   | 83,435  | 20.66%  |   |   |
| 242 | 1961 |   | 2,580  | 240   | 904   | 1,349 | 45  | 42  | 0.84          |   | 1961 |   | 86,015  | 21.30%  |   |   |
| 243 | 1962 |   | 2,686  | 263   | 980   | 1,351 | 49  | 44  | 0.86          |   | 1962 |   | 88,701  | 21.97%  |   |   |
| 244 | 1963 |   | 2,833  | 286   | 1,052 | 1,396 | 51  | 47  | 0.88          |   | 1963 |   | 91,534  | 22.67%  |   |   |
| 245 | 1964 |   | 2,995  | 316   | 1,137 | 1,435 | 57  | 51  | 0.92          |   | 1964 |   | 94,529  | 23.41%  |   |   |
| 246 | 1965 |   | 3,130  | 337   | 1,219 | 1,460 | 59  | 55  | 0.94          |   | 1965 |   | 97,659  | 24.18%  |   |   |
| 247 | 1966 |   | 3,288  | 364   | 1,323 | 1,478 | 63  | 60  | 0.97          |   | 1966 |   | 100,947 | 25.00%  |   |   |
| 248 | 1967 |   | 3,393  | 392   | 1,423 | 1,448 | 65  | 66  | 0.98          |   | 1967 |   | 104,340 | 25.84%  |   |   |
| 249 | 1968 |   | 3,566  | 424   | 1,551 | 1,448 | 70  | 73  | 1.01          |   | 1968 |   | 107,906 | 26.72%  |   |   |
| 250 | 1969 |   | 3,780  | 467   | 1,673 | 1,486 | 74  | 80  | 1.05          |   | 1969 |   | 111,686 | 27.66%  |   |   |
| 251 | 1970 |   | 4,053  | 493   | 1,839 | 1,556 | 78  | 87  | 1.10          |   | 1970 |   | 115,739 | 28.66%  |   |   |
| 252 | 1971 |   | 4,208  | 530   | 1,947 | 1,559 | 84  | 88  | 1.12          |   | 1971 |   | 119,947 | 29.70%  |   |   |
| 253 | 1972 |   | 4,376  | 560   | 2,057 | 1,576 | 89  | 94  | 1.14          |   | 1972 |   | 124,323 | 30.79%  |   |   |
| 254 | 1973 |   | 4,614  | 588   | 2,241 | 1,581 | 95  | 110 | 1.18          |   | 1973 |   | 128,937 | 31.93%  |   |   |
| 255 | 1974 |   | 4,623  | 597   | 2,245 | 1,579 | 96  | 107 | 1.16          |   | 1974 |   | 133,560 | 33.07%  |   |   |
| 256 | 1975 |   | 4,596  | 604   | 2,132 | 1,673 | 95  | 92  | 1.13          |   | 1975 |   | 138,156 | 34.21%  |   |   |
| 257 | 1976 |   | 4,864  | 630   | 2,314 | 1,710 | 103 | 108 | 1.17          |   | 1976 |   | 143,020 | 35.42%  |   |   |
| 258 | 1977 |   | 5,026  | 650   | 2,398 | 1,765 | 108 | 104 | 1.19          |   | 1977 |   | 148,046 | 36.66%  |   |   |
| 259 | 1978 |   | 5,087  | 680   | 2,392 | 1,793 | 116 | 106 | 1.18          |   | 1978 |   | 153,133 | 37.92%  |   |   |
| 260 | 1979 |   | 5,369  | 721   | 2,544 | 1,887 | 119 | 98  | 1.23          |   | 1979 |   | 158,502 | 39.25%  |   |   |
| 261 | 1980 |   | 5,315  | 740   | 2,422 | 1,947 | 120 | 86  | 1.19          |   | 1980 |   | 163,817 | 40.57%  |   |   |
| 262 | 1981 |   | 5,152  | 756   | 2,289 | 1,921 | 121 | 64  | 1.14          |   | 1981 |   | 168,969 | 41.84%  |   |   |
| 263 | 1982 |   | 5,113  | 740   | 2,196 | 1,992 | 121 | 64  | 1.11          |   | 1982 |   | 174,082 | 43.11%  |   |   |
| 264 | 1983 |   | 5,094  | 741   | 2,176 | 1,995 | 125 | 58  | 1.09          |   | 1983 |   | 179,176 | 44.37%  |   |   |
| 265 | 1984 |   | 5,280  | 808   | 2,199 | 2,094 | 128 | 51  | 1.11          |   | 1984 |   | 184,456 | 45.68%  |   |   |
| 266 | 1985 |   | 5,439  | 837   | 2,186 | 2,237 | 131 | 49  | 1.12          |   | 1985 |   | 189,895 | 47.03%  |   |   |
| 267 | 1986 |   | 5,607  | 831   | 2,293 | 2,300 | 137 | 46  | 1.13          |   | 1986 |   | 195,502 | 48.41%  |   |   |
| 268 | 1987 |   | 5,752  | 894   | 2,306 | 2,364 | 143 | 44  | 1.14          |   | 1987 |   | 201,254 | 49.84%  |   |   |
| 269 | 1988 |   | 5,965  | 937   | 2,412 | 2,414 | 152 | 50  | 1.16          |   | 1988 |   | 207,219 | 51.32%  |   |   |
| 270 | 1989 |   | 6,097  | 985   | 2,459 | 2,457 | 156 | 41  | 1.17          |   | 1989 |   | 213,316 | 52.83%  |   |   |
| 271 | 1990 |   | 6,127  | 1,019 | 2,492 | 2,419 | 157 | 40  | 1.15          |   | 1990 |   | 219,443 | 54.34%  |   |   |
| 272 | 1991 |   | 6,217  | 1,063 | 2,605 | 2,345 | 161 | 44  | 1.15          |   | 1991 |   | 225,660 | 55.88%  |   |   |
| 273 | 1992 |   | 6,164  | 1,095 | 2,510 | 2,357 | 167 | 35  | 1.12          |   | 1992 |   | 231,824 | 57.41%  |   |   |
| 274 | 1993 |   | 6,162  | 1,129 | 2,523 | 2,298 | 176 | 36  | 1.10          |   | 1993 |   | 237,986 | 58.94%  |   |   |
| 275 | 1994 |   | 6,266  | 1,139 | 2,546 | 2,358 | 186 | 38  | 1.11          |   | 1994 |   | 244,252 | 60.49%  |   |   |
| 276 | 1995 |   | 6,398  | 1,157 | 2,565 | 2,442 | 197 | 36  | 1.11          |   | 1995 |   | 250,650 | 62.07%  |   |   |
| 277 | 1996 |   | 6,542  | 1,209 | 2,624 | 2,469 | 203 | 37  | 1.12          |   | 1996 |   | 257,192 | 63.69%  |   |   |
| 278 | 1997 |   | 6,651  | 1,208 | 2,700 | 2,495 | 209 | 38  | 1.13          |   | 1997 |   | 263,843 | 65.34%  |   |   |
| 279 | 1998 |   | 6,643  | 1,243 | 2,766 | 2,391 | 209 | 35  | 1.11          |   | 1998 |   | 270,486 | 66.98%  |   |   |
| 280 | 1999 |   | 6,610  | 1,270 | 2,737 | 2,352 | 217 | 33  | 1.09          |   | 1999 |   | 277,096 | 68.62%  |   |   |
| 281 | 2000 |   | 6,765  | 1,288 | 2,838 | 2,367 | 226 | 45  | 1.10          |   | 2000 |   | 283,861 | 70.30%  |   |   |
| 282 | 2001 |   | 6,927  | 1,312 | 2,840 | 2,492 | 237 | 46  | 1.12          |   | 2001 |   | 290,788 | 72.01%  |   |   |
| 283 | 2002 |   | 6,996  | 1,344 | 2,831 | 2,521 | 252 | 48  | 1.11          |   | 2002 |   | 297,784 | 73.74%  |   |   |
| 284 | 2003 |   | 7,416  | 1,391 | 2,959 | 2,743 | 276 | 48  | 1.17          |   | 2003 |   | 305,200 | 75.58%  |   |   |
| 285 | 2004 |   | 7,807  | 1,437 | 3,053 | 2,967 | 298 | 53  | 1.21          |   | 2004 |   | 313,007 | 77.51%  |   |   |
| 286 | 2005 |   | 8,093  | 1,480 | 3,076 | 3,157 | 320 | 60  | 1.24          |   | 2005 |   | 321,100 | 79.52%  |   |   |
| 287 | 2006 |   | 8,370  | 1,525 | 3,089 | 3,339 | 356 | 61  | 1.27          |   | 2006 |   | 329,470 | 81.59%  |   |   |
| 288 | 2007 |   | 8,566  | 1,572 | 3,081 | 3,464 | 382 | 68  | 1.28          |   | 2007 |   | 338,036 | 83.71%  |   |   |
| 289 | 2008 |   | 8,783  | 1,631 | 3,122 | 3,571 | 388 | 71  | 1.30          |   | 2008 |   | 346,819 | 85.89%  |   |   |
| 290 | 2009 |   | 8,740  | 1,585 | 3,056 | 3,620 | 413 | 66  | 1.28          |   | 2009 |   | 355,559 | 88.05%  |   |   |
| 291 | 2010 |   | 9,167  | 1,702 | 3,114 | 3,842 | 450 | 59  | 1.33          |   | 2010 |   | 364,726 | 90.32%  |   |   |
| 292 | 2011 |   | 9,457  | 1,730 | 3,149 | 4,021 | 499 | 59  | 1.35          |   | 2011 |   | 374,183 | 92.66%  |   |   |
| 293 | 2012 |   | 9,668  | 1,772 | 3,190 | 4,124 | 524 | 59  | 1.37          |   | 2012 |   | 383,852 | 95.06%  |   |   |
| 294 | 2013 |   | 9,861  | 1,791 | 3,226 | 4,238 | 547 | 59  | 1.38          |   | 2013 |   | 393,713 | 97.50%  |   |   |
| 295 | 2014 |   | 10,098 | 1,834 | 3,303 | 4,340 | 560 | 60  | forecast 2014 |   | 2014 |   | 403,810 | 100.00% |   |   |
| 296 | 2015 |   |        |       |       |       |     |     |               |   | 2015 |   |         |         |   |   |
| 297 | 2016 |   |        |       |       |       |     |     |               |   | 2016 |   |         |         |   |   |
| 298 | 2017 |   |        |       |       |       |     |     |               |   | 2017 |   |         |         |   |   |
| 299 | 2018 |   |        |       |       |       |     |     |               |   | 2018 |   |         |         |   |   |
| 300 | 2019 |   |        |       |       |       |     |     |               |   | 2019 |   |         |         |   |   |
| 301 | 2020 |   |        |       |       |       |     |     |               |   | 2020 |   |         |         |   |   |

2.40% calculated percentage growth 2014 forecast (GCP) over GCP data for 2013.  
 data 1959 to 2013 linked to Global Carbon Project data files.  
 Last modified 22Sep14

### Analysis of emissions 1988-2014 of global historic emissions since 1751

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Table 2

| Year                           | Total     | Gas     | Liquids | Solids  | Cement | Flaring |                    |
|--------------------------------|-----------|---------|---------|---------|--------|---------|--------------------|
| 1751-2014                      | 403,810   | 55,279  | 141,781 | 192,110 | 11,012 | 3,634   | MtC                |
| 1751-2014                      | 1,479,639 | 202,552 | 519,511 | 703,929 | 40,352 | 13,317  | MtCO2              |
| Percent of 2014                | 100.0%    | 18.2%   | 32.7%   | 43.0%   | 5.5%   | 0.6%    | percent, by source |
| % of 1751-2014                 | 100.0%    | 13.7%   | 35.1%   | 47.6%   | 2.7%   | 0.9%    | percent, by source |
| 1751-1987                      | 201,254   | 18,431  | 64,915  | 112,508 | 3,094  | 2,309   | MtC                |
| 1988-2014                      | 202,556   | 36,848  | 76,866  | 79,602  | 7,918  | 1,325   | MtC                |
| Percent 1751-1987 of 1751-2014 | 49.8%     | 33.3%   | 45.8%   | 58.6%   | 28.1%  | 63.5%   | percent, by period |
| Percent 1988-2014 of 1751-2014 | 50.2%     | 66.7%   | 54.2%   | 41.4%   | 71.9%  | 36.5%   | percent, by period |

**Cell:** E19**Comment:** Rick Heede:

Boden, T. A., G. Marland, & R. J. Andres (2013) Global, Regional, and National Fossil-Fuel CO2 Emissions, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., USA doi 10.3334/CDIAC/00001\_V2013

**Cell:** E21**Comment:** Rick Heede:

Le Quéré, C., Moriarty, R., Andrew, R. M., Peters, G. P., Ciais, P., Friedlingstein, P., Jones, S. D., Sitch, S., Tans, P., Arneeth, A., Boden, T. A., Bopp, L., Bozec, Y., Canadell, J. G., Chevallier, F., Cosca, C. E., Harris, I., Hoppema, M., Houghton, R. A., House, J. I., Jain, A., Johannessen, T., Kato, E., Keeling, R. F., Kitidis, V., Klein Goldewijk, K., Koven, C., Landa, C. S., Landschützer, P., Lenton, A., Lima, I. D., Marland, G., Mathis, J. T., Metz, N., Nojiri, Y., Olsen, A., Ono, T., Peters, W., Pfeil, B., Poulter, B., Raupach, M. R., Regnier, P., Rodenbeck, C., Saito, S., Salisbury, J. E., Schuster, U., Schwinger, J., Séférian, R., Segsneider, J., Steinhoff, T., Stocker, B. D., Sutton, A. J., Takahashi, T., Tilbrook, B., van der Werf, G. R., Viovy, N., Wang, Y.-P., Wanninkhof, R., Wiltshire, A., & Zeng, N. (2014) Global carbon budget 2014, Earth Syst. Sci. Data Discuss., vol. 7:521-610, doi:10.5194/essdd-7-521-2014, 2014.

**Cell:** E23**Comment:** Rick Heede:

Friedlingstein, P., R. M. Andrew, J. Rogelj, G. P. Peters, J. G. Canadell, R. Knutti, G. Luderer, M. R. Raupach, M. Schaeffer, D. P. van Vuuren, & C. Le Quéré (2014) Persistent growth of CO2 emissions and implications for reaching climate targets, Nature Geoscience, early edition; doi:10.1038/ngeo2248.  
See also: Global Carbon Project (2014) Global Carbon Budget 2013, September 2014, Tsukuba, Japan, globalcarbonproject.org.

**Cell:** K23**Comment:** Rick Heede:

Le Quéré, C., Moriarty, R., Andrew, R. M., Peters, G. P., Ciais, P., Friedlingstein, P., Jones, S. D., Sitch, S., Tans, P., Arneeth, A., Boden, T. A., Bopp, L., Bozec, Y., Canadell, J. G., Chevallier, F., Cosca, C. E., Harris, I., Hoppema, M., Houghton, R. A., House, J. I., Jain, A., Johannessen, T., Kato, E., Keeling, R. F., Kitidis, V., Klein Goldewijk, K., Koven, C., Landa, C. S., Landschützer, P., Lenton, A., Lima, I. D., Marland, G., Mathis, J. T., Metz, N., Nojiri, Y., Olsen, A., Ono, T., Peters, W., Pfeil, B., Poulter, B., Raupach, M. R., Regnier, P., Rodenbeck, C., Saito, S., Salisbury, J. E., Schuster, U., Schwinger, J., Séférian, R., Segsneider, J., Steinhoff, T., Stocker, B. D., Sutton, A. J., Takahashi, T., Tilbrook, B., van der Werf, G. R., Viovy, N., Wang, Y.-P., Wanninkhof, R., Wiltshire, A., & Zeng, N. (2014) Global carbon budget 2014, Earth Syst. Sci. Data Discuss., vol. 7:521-610, doi:10.5194/essdd-7-521-2014, 2014.

**Cell:** J289**Comment:** Rick Heede:

Nov11: Used mid-year world population estimates to calculate tonnes Carbon per capita.

**Cell:** D295**Comment:** Rick Heede:

Projection by Heede, 22Sep14, based on sum increase estimated by GCP for 2014 (37.0 GtCO2), or 2.4 percent over 2013. Source emissions are all increased by 2.4%.

**Cell:** F298**Comment:** Rick Heede:

Le Quéré, C., Moriarty, R., Andrew, R. M., Peters, G. P., Ciais, P., Friedlingstein, P., Jones, S. D., Sitch, S., Tans, P., Arneeth, A., Boden, T. A., Bopp, L., Bozec, Y., Canadell, J. G., Chevallier, F., Cosca, C. E., Harris, I., Hoppema, M., Houghton, R. A., House, J. I., Jain, A., Johannessen, T., Kato, E., Keeling, R. F., Kitidis, V., Klein Goldewijk, K., Koven, C., Landa, C. S., Landschützer, P., Lenton, A., Lima, I. D., Marland, G., Mathis, J. T., Metz, N., Nojiri, Y., Olsen, A., Ono, T., Peters, W., Pfeil, B., Poulter, B., Raupach, M. R., Regnier, P., Rodenbeck, C., Saito, S., Salisbury, J. E., Schuster, U., Schwinger, J., Séférian, R., Segsneider, J., Steinhoff, T., Stocker, B. D., Sutton, A. J., Takahashi, T., Tilbrook, B., van der Werf, G. R., Viovy, N., Wang, Y.-P., Wanninkhof, R., Wiltshire, A., & Zeng, N. (2014) Global carbon budget 2014, Earth Syst. Sci. Data Discuss., vol. 7:521-610, doi:10.5194/essdd-7-521-2014, 2014.  
See also www.globalcarbonproject.org