International Energy Outlook 2023

Release date: October 2023

Table A1. World total primary energy consumption by region, Reference case

quadrillion British thermal units

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**152.6**	**152.3**	**155.8**	**160.3**	**165.0**	**171.2**	**178.7**	**0.6%**
United States	98.9	97.3	97.4	98.3	99.4	101.9	105.1	0.2%
Canada	14.7	14.7	15.5	16.4	17.5	18.7	20.1	1.1%
Mexico	7.7	7.8	8.4	8.9	9.3	9.9	10.5	1.1%
Brazil	14.9	15.6	16.5	17.4	17.9	18.3	18.8	0.8%
Other Americas	16.4	16.8	18.0	19.3	20.8	22.4	24.2	1.4%
Europe and Eurasia	**130.1**	**132.9**	**134.3**	**138.1**	**143.1**	**148.3**	**154.4**	**0.6%**
Western Europe	84.2	86.1	86.9	88.7	91.2	93.6	96.7	0.5%
Russia	33.5	33.9	34.1	35.3	36.4	37.8	39.2	0.6%
Eastern Europe and Eurasia	12.3	12.8	13.3	14.2	15.4	16.8	18.5	1.5%
Asia Pacific	**292.6**	**309.4**	**336.6**	**360.5**	**381.1**	**403.7**	**424.1**	**1.3%**
Japan	18.6	18.6	17.1	16.5	16.2	15.9	15.8	-0.6%
South Korea	13.0	13.5	13.8	14.1	14.2	14.2	14.3	0.3%
Australia and New Zealand	7.2	7.2	7.7	8.0	8.4	8.8	9.2	0.9%
China	172.5	179.7	187.2	191.4	192.8	194.9	195.4	0.4%
India	38.3	43.5	56.2	69.4	82.5	96.7	110.4	3.9%
Other Asia Pacific	43.1	46.9	54.5	61.1	67.1	73.2	78.9	2.2%
Africa and Middle East	**62.5**	**66.9**	**71.4**	**77.4**	**83.1**	**90.4**	**97.6**	**1.6%**
Africa	24.3	26.0	29.5	33.6	37.2	42.5	47.8	2.4%
Middle East	38.2	40.8	42.0	43.9	45.9	47.9	49.8	0.9%
World	**637.8**	**661.4**	**698.2**	**736.4**	**772.2**	**813.6**	**854.7**	**1.1%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. We converted electricity generation from renewable sources such as hydroelectric, wind, or solar to British thermal units at a rate of 8,124 British thermal units per kilowatthour, which reflects the average projected conversion efficiency of the U.S. fossil-fueled generating fleet in the Annual Energy Outlook 2021 over the projection period (2022–2050).

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Table A2. World total primary energy consumption by region and fuel, Reference case

quadrillion British thermal units

Region and fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas								
Liquid fuels	57.6	57.6	56.7	56.5	57.3	58.8	60.8	0.2%
Natural gas	45.7	43.5	43.8	43.8	45.5	47.0	48.7	0.2%
Coal	11.3	10.1	6.1	6.5	6.5	6.5	6.2	-2.1%
Nuclear	9.4	9.3	9.4	8.8	7.7	7.5	7.3	-0.9%
Other	28.6	31.6	39.9	44.8	48.0	51.5	55.7	2.4%
Total	**152.6**	**152.3**	**155.8**	**160.3**	**165.0**	**171.2**	**178.7**	**0.6%**
Europe and Eurasia								
Liquid fuels	38.1	38.5	37.4	36.7	36.7	37.3	38.2	0.0%
Natural gas	43.7	44.5	46.0	47.2	49.1	51.2	53.7	0.7%
Coal	16.5	16.2	14.7	14.8	14.9	15.8	16.4	0.0%
Nuclear	10.4	10.6	11.1	11.3	11.2	11.0	11.1	0.2%
Other	21.4	23.0	25.1	28.2	31.1	32.9	35.1	1.8%
Total	**130.1**	**132.9**	**134.3**	**138.1**	**143.1**	**148.3**	**154.4**	**0.6%**
Asia Pacific								
Liquid fuels	71.4	77.2	83.1	88.3	92.8	97.5	101.7	1.3%
Natural gas	35.3	37.5	40.3	42.8	46.0	50.2	54.4	1.6%
Coal	133.7	133.0	140.2	143.1	141.6	140.9	141.6	0.2%
Nuclear	7.6	8.7	10.5	12.0	13.2	14.0	14.9	2.4%
Other	44.7	53.0	62.5	74.3	87.6	101.1	111.5	3.3%
Total	**292.6**	**309.4**	**336.6**	**360.5**	**381.1**	**403.7**	**424.1**	**1.3%**
Africa and Middle East								
Liquid fuels	23.3	24.8	24.8	25.8	27.3	29.1	31.1	1.0%
Natural gas	28.6	29.8	31.4	33.6	35.8	38.1	40.3	1.2%
Coal	4.6	4.5	5.1	6.1	6.3	7.2	7.9	2.0%
Nuclear	0.4	0.6	0.9	1.2	1.4	1.4	1.4	4.9%
Other	5.7	7.1	9.2	10.7	12.2	14.5	16.8	3.9%
Total	**62.5**	**66.9**	**71.4**	**77.4**	**83.1**	**90.4**	**97.6**	**1.6%**
World								
Liquid fuels	190.4	198.2	202.0	207.3	214.0	222.8	231.9	0.7%
Natural gas	153.3	155.4	161.4	167.4	176.4	186.5	197.0	0.9%
Coal	166.0	163.8	166.1	170.4	169.3	170.5	172.1	0.1%
Nuclear	27.7	29.3	31.9	33.4	33.6	33.9	34.7	0.8%
Other	100.5	114.8	136.8	157.9	178.9	199.9	219.0	2.8%
Total	**637.8**	**661.4**	**698.2**	**736.4**	**772.2**	**813.6**	**854.7**	**1.1%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. We converted electricity generation from renewable sources such as hydroelectric, wind, or solar to British thermal units at a rate of 8,124 British thermal units per kilowatthour, which reflects the average projected conversion efficiency of the U.S. fossil-fueled generating fleet in the Annual Energy Outlook 2021 over the projection period (2022–2050).

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Table A3. World GDP by region expressed in purchasing power parity, Reference case

billion 2015 dollars

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**$32,285**	**$33,677**	**$37,275**	**$40,974**	**$45,211**	**$49,889**	**$54,965**	**1.9%**
United States	$20,671	$21,361	$23,436	$25,653	$28,414	$31,534	$34,962	1.9%
Canada	$1,791	$1,872	$2,103	$2,304	$2,513	$2,732	$2,966	1.8%
Mexico	$2,367	$2,484	$2,737	$2,999	$3,261	$3,531	$3,814	1.7%
Brazil	$3,182	$3,340	$3,695	$3,968	$4,130	$4,255	$4,341	1.1%
Other Americas	$4,273	$4,621	$5,305	$6,050	$6,892	$7,837	$8,882	2.6%
Europe and Eurasia	**$31,730**	**$33,224**	**$35,928**	**$38,541**	**$41,429**	**$44,496**	**$47,822**	**1.5%**
Western Europe	$26,269	$27,336	$29,336	$31,204	$33,214	$35,273	$37,452	1.3%
Russia	$3,763	$3,973	$4,217	$4,375	$4,557	$4,764	$4,993	1.0%
Eastern Europe and Eurasia	$1,698	$1,914	$2,375	$2,962	$3,658	$4,459	$5,377	4.2%
Asia Pacific	**$58,793**	**$67,172**	**$83,281**	**$99,547**	**$115,494**	**$132,219**	**$148,166**	**3.4%**
Japan	$5,292	$5,479	$5,661	$5,679	$5,701	$5,716	$5,755	0.3%
South Korea	$2,292	$2,431	$2,633	$2,777	$2,856	$2,929	$2,991	1.0%
Australia and New Zealand	$1,524	$1,638	$1,900	$2,127	$2,337	$2,541	$2,747	2.1%
China	$26,404	$30,400	$37,478	$44,342	$50,298	$56,331	$61,166	3.0%
India	$10,049	$12,031	$16,630	$21,735	$27,153	$33,024	$39,164	5.0%
Other Asia Pacific	$13,232	$15,193	$18,979	$22,887	$27,150	$31,677	$36,343	3.7%
Africa and Middle East	**$12,838**	**$14,048**	**$16,064**	**$18,211**	**$20,322**	**$22,391**	**$24,401**	**2.3%**
Africa	$7,050	$7,691	$9,017	$10,434	$11,894	$13,427	$15,004	2.7%
Middle East	$5,788	$6,357	$7,046	$7,777	$8,428	$8,964	$9,398	1.7%
World	**$135,647**	**$148,121**	**$172,547**	**$197,274**	**$222,456**	**$248,995**	**$275,355**	**2.6%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; Oxford Economics, Global Economic Model (February 2023), www.oxfordeconomics.com (subscription site)

Note: Totals may not equal sum of components due to independent rounding.

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Table A4. World GDP by region expressed in market exchange rates, Reference case

billion 2015 dollars

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**$28,078**	**$29,194**	**$32,220**	**$35,342**	**$38,990**	**$43,033**	**$47,427**	**1.9%**
United States	$20,671	$21,361	$23,436	$25,653	$28,414	$31,534	$34,962	1.9%
Canada	$1,748	$1,827	$2,052	$2,248	$2,453	$2,667	$2,895	1.8%
Mexico	$1,242	$1,304	$1,436	$1,574	$1,712	$1,853	$2,002	1.7%
Brazil	$1,900	$1,994	$2,206	$2,369	$2,466	$2,541	$2,592	1.1%
Other Americas	$2,516	$2,708	$3,090	$3,496	$3,945	$4,439	$4,976	2.5%
Europe and Eurasia	**$22,949**	**$23,897**	**$25,663**	**$27,295**	**$29,103**	**$31,024**	**$33,091**	**1.3%**
Western Europe	$20,883	$21,672	$23,167	$24,511	$25,976	$27,502	$29,116	1.2%
Russia	$1,456	$1,538	$1,632	$1,693	$1,764	$1,844	$1,932	1.0%
Eastern Europe and Eurasia	$610	$688	$864	$1,091	$1,363	$1,678	$2,043	4.4%
Asia Pacific	**$32,233**	**$36,392**	**$44,057**	**$51,533**	**$58,587**	**$65,880**	**$72,554**	**2.9%**
Japan	$4,521	$4,681	$4,836	$4,852	$4,870	$4,883	$4,916	0.3%
South Korea	$1,738	$1,843	$1,996	$2,106	$2,165	$2,221	$2,268	1.0%
Australia and New Zealand	$1,671	$1,796	$2,084	$2,333	$2,563	$2,788	$3,013	2.1%
China	$16,177	$18,625	$22,962	$27,167	$30,816	$34,513	$37,475	3.0%
India	$2,927	$3,506	$4,846	$6,334	$7,912	$9,623	$11,413	5.0%
Other Asia Pacific	$5,199	$5,942	$7,333	$8,742	$10,259	$11,852	$13,469	3.5%
Africa and Middle East	**$5,526**	**$6,049**	**$6,890**	**$7,795**	**$8,692**	**$9,570**	**$10,432**	**2.3%**
Africa	$2,723	$2,964	$3,471	$4,016	$4,583	$5,182	$5,798	2.7%
Middle East	$2,803	$3,085	$3,419	$3,779	$4,109	$4,388	$4,634	1.8%
World	**$88,786**	**$95,533**	**$108,829**	**$121,965**	**$135,372**	**$149,508**	**$163,503**	**2.2%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; Oxford Economics, Global Economic Model (February 2023), www.oxfordeconomics.com (subscription site)

Note: Totals may not equal sum of components due to independent rounding.

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Table A5. World liquid fuels consumption by region, Reference case

million barrels per day

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**30.6**	**30.8**	**30.5**	**30.5**	**31.0**	**31.8**	**33.0**	**0.3%**
United States	19.9	19.9	19.6	19.3	19.3	19.6	20.2	0.0%
Canada	2.3	2.3	2.3	2.4	2.5	2.6	2.7	0.6%
Mexico	1.9	1.9	1.9	1.9	1.9	2.0	2.1	0.4%
Brazil	3.0	3.1	3.1	3.2	3.2	3.3	3.4	0.5%
Other Americas	3.5	3.6	3.6	3.8	4.0	4.3	4.6	0.9%
Europe and Eurasia	**18.8**	**19.0**	**18.4**	**18.1**	**18.1**	**18.5**	**18.9**	**0.0%**
Western Europe	14.3	14.2	13.6	13.2	13.0	13.0	13.2	-0.3%
Russia	3.4	3.6	3.6	3.6	3.7	3.9	4.0	0.5%
Eastern Europe and Eurasia	1.1	1.2	1.2	1.3	1.4	1.6	1.7	1.7%
Asia Pacific	**36.0**	**38.9**	**42.0**	**44.7**	**47.0**	**49.5**	**51.7**	**1.3%**
Japan	3.4	3.2	3.0	2.8	2.7	2.5	2.5	-1.1%
South Korea	2.6	2.7	2.7	2.7	2.6	2.6	2.5	-0.1%
Australia and New Zealand	1.2	1.3	1.3	1.3	1.3	1.3	1.4	0.4%
China	15.1	16.6	17.5	17.8	17.6	17.5	17.3	0.5%
India	5.0	5.8	7.3	9.0	10.9	12.6	14.3	3.8%
Other Asia Pacific	8.7	9.3	10.2	11.1	12.0	12.9	13.7	1.7%
Africa and Middle East	**13.6**	**14.5**	**14.6**	**15.1**	**15.9**	**16.9**	**17.9**	**1.0%**
Africa	4.4	4.8	5.1	5.6	6.2	6.9	7.7	2.0%
Middle East	9.2	9.7	9.5	9.5	9.7	10.0	10.2	0.4%
World	**99.1**	**103.2**	**105.5**	**108.5**	**112.1**	**116.7**	**121.5**	**0.7%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459; Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; and Short-Term Energy Outlook (April 2023)

Note: Totals may not equal sum of components due to independent rounding. Liquid fuels include motor gasoline, distillate, residual, kerosene, jet fuel, liquid petroleum gases, sequestered petroleum, other petroleum, petroleum coke, crude oil (including lease and plant condensate), ethanol, and other biofuels across all demand sectors. EIA's Glossary includes descriptions of individual liquid fuel components.

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Table A6. World natural gas consumption by region, Reference case

trillion cubic feet

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**45.0**	**43.0**	**43.3**	**43.6**	**45.3**	**46.8**	**48.6**	**0.3%**
United States	32.3	29.8	28.5	28.0	28.9	29.7	30.5	-0.2%
Canada	4.3	4.4	5.1	5.5	5.9	6.2	6.7	1.6%
Mexico	2.7	2.8	3.2	3.4	3.7	3.8	4.0	1.4%
Brazil	1.3	1.5	1.7	1.6	1.5	1.5	1.5	0.4%
Other Americas	4.3	4.4	4.8	5.1	5.3	5.6	5.9	1.1%
Europe and Eurasia	**42.3**	**43.1**	**44.5**	**45.7**	**47.6**	**49.7**	**52.1**	**0.7%**
Western Europe	19.8	20.6	21.8	21.6	21.7	21.9	22.2	0.4%
Russia	17.0	16.8	17.1	18.2	19.2	20.2	21.3	0.8%
Eastern Europe and Eurasia	5.5	5.8	5.7	5.9	6.7	7.5	8.5	1.6%
Asia Pacific	**34.9**	**37.2**	**40.0**	**42.6**	**45.7**	**49.9**	**54.0**	**1.6%**
Japan	4.1	4.2	3.9	3.6	3.4	3.4	3.4	-0.7%
South Korea	2.5	2.5	2.4	2.3	2.2	2.2	2.2	-0.4%
Australia and New Zealand	2.0	2.1	2.3	2.3	2.4	2.6	2.7	1.1%
China	14.1	15.0	16.2	17.8	19.9	22.1	24.2	2.0%
India	2.5	2.9	3.9	5.0	6.1	7.2	8.3	4.4%
Other Asia Pacific	9.7	10.6	11.4	11.6	11.7	12.4	13.2	1.1%
Africa and Middle East	**28.4**	**29.6**	**31.1**	**33.2**	**35.4**	**37.5**	**39.6**	**1.2%**
Africa	6.2	6.4	6.8	7.4	8.1	8.8	9.6	1.6%
Middle East	22.1	23.2	24.2	25.8	27.2	28.7	30.0	1.1%
World	**150.6**	**152.9**	**158.9**	**165.1**	**174.0**	**183.9**	**194.3**	**0.9%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. Natural gas consumption excludes nonhydrocarbon gases.

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Table A7. World coal consumption by region, Reference case

million short tons

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**573**	**511**	**297**	**312**	**310**	**307**	**291**	**-2.4%**
United States	499	444	223	219	193	180	162	-3.9%
Canada	25	15	5	6	6	6	6	-5.2%
Mexico	7	7	13	14	15	15	15	2.7%
Brazil	25	26	26	28	31	29	29	0.6%
Other Americas	17	19	29	46	66	78	79	5.6%
Europe and Eurasia	**1,019**	**996**	**854**	**856**	**848**	**921**	**959**	**-0.2%**
Western Europe	642	614	481	487	471	533	560	-0.5%
Russia	238	248	232	219	222	225	227	-0.2%
Eastern Europe and Eurasia	138	134	141	149	156	164	172	0.8%
Asia Pacific	**6,696**	**6,665**	**7,085**	**7,240**	**7,201**	**7,198**	**7,256**	**0.3%**
Japan	194	191	134	135	130	125	121	-1.7%
South Korea	110	109	113	117	119	121	121	0.3%
Australia and New Zealand	100	92	105	114	115	116	116	0.5%
China	4,677	4,565	4,530	4,432	4,169	3,938	3,812	-0.7%
India	1,063	1,141	1,461	1,573	1,683	1,800	1,869	2.0%
Other Asia Pacific	551	567	743	869	985	1,099	1,217	2.9%
Africa and Middle East	**177**	**170**	**196**	**240**	**244**	**282**	**307**	**2.0%**
Africa	165	159	184	228	232	270	295	2.1%
Middle East	12	11	11	12	12	12	12	0.1%
World	**8,465**	**8,343**	**8,432**	**8,648**	**8,603**	**8,708**	**8,813**	**0.1%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A8. World nuclear energy consumption by region (net nuclear electricity generation), Reference case

billion kilowatthours

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**889**	**891**	**896**	**839**	**738**	**716**	**703**	**-0.8%**
United States	772	782	758	700	625	626	625	-0.8%
Canada	79	71	77	72	51	39	28	-3.7%
Mexico	11	11	20	28	23	17	17	1.4%
Brazil	14	14	23	23	23	18	18	0.9%
Other Americas	12	12	18	15	15	15	15	0.8%
Europe and Eurasia	**995**	**1,003**	**1,044**	**1,062**	**1,055**	**1,036**	**1,039**	**0.2%**
Western Europe	734	723	733	727	720	702	702	-0.2%
Russia	217	229	234	234	234	234	227	0.2%
Eastern Europe and Eurasia	44	52	77	101	101	101	111	3.4%
Asia Pacific	**746**	**837**	**993**	**1,143**	**1,253**	**1,329**	**1,420**	**2.3%**
Japan	78	115	139	139	121	102	102	0.9%
South Korea	201	228	228	228	228	218	214	0.2%
Australia and New Zealand	0	0	0	0	0	0	0	0.0%
China	383	416	538	674	799	903	998	3.5%
India	41	42	52	67	70	70	70	1.9%
Other Asia Pacific	43	36	36	36	36	36	36	-0.6%
Africa and Middle East	**37**	**54**	**87**	**116**	**135**	**135**	**135**	**4.8%**
Africa	13	13	30	43	52	52	52	5.1%
Middle East	24	41	58	73	83	83	83	4.6%
World	**2,666**	**2,786**	**3,020**	**3,160**	**3,181**	**3,216**	**3,297**	**0.8%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A9. World consumption of renewable energy by region, Reference case

quadrillion British thermal units

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**28.6**	**31.6**	**39.9**	**44.8**	**48.0**	**51.5**	**55.7**	**2.4%**
United States	11.4	14.1	20.9	24.0	25.6	27.1	29.1	3.4%
Canada	4.3	4.4	4.6	5.0	5.7	6.5	7.3	1.9%
Mexico	1.0	0.9	1.1	1.2	1.3	1.6	1.8	2.4%
Brazil	7.4	7.6	8.1	9.0	9.4	9.8	10.1	1.1%
Other Americas	4.5	4.6	5.2	5.6	5.9	6.5	7.3	1.7%
Europe and Eurasia	**21.4**	**23.0**	**25.1**	**28.2**	**31.1**	**32.9**	**35.1**	**1.8%**
Western Europe	18.4	19.8	21.9	24.7	27.8	29.5	31.6	2.0%
Russia	2.2	2.2	2.2	2.4	2.2	2.2	2.2	0.2%
Eastern Europe and Eurasia	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2%
Asia Pacific	**44.7**	**53.0**	**62.5**	**74.3**	**87.6**	**101.1**	**111.5**	**3.3%**
Japan	2.4	2.2	2.5	2.6	3.1	3.3	3.5	1.4%
South Korea	0.6	0.6	0.8	1.1	1.3	1.5	1.7	3.7%
Australia and New Zealand	1.4	1.5	1.7	1.9	2.2	2.4	2.7	2.4%
China	26.6	31.7	35.4	37.8	41.9	45.9	46.7	2.0%
India	7.4	9.4	12.8	19.4	25.6	33.0	40.7	6.3%
Other Asia Pacific	6.3	7.6	9.3	11.5	13.5	15.0	16.2	3.5%
Africa and Middle East	**5.7**	**7.1**	**9.2**	**10.7**	**12.2**	**14.5**	**16.8**	**3.9%**
Africa	5.3	6.3	7.9	9.3	10.7	12.9	15.2	3.8%
Middle East	0.4	0.8	1.3	1.4	1.5	1.6	1.7	5.3%
World	**100.5**	**114.8**	**136.8**	**157.9**	**178.9**	**199.9**	**219.0**	**2.8%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding. We converted electricity generation from renewable sources such as hydroelectric, wind, or solar to British thermal units at a rate of 8,124 British thermal units per kilowatthour, which reflects the average projected conversion efficiency of the U.S. fossil-fueled generating fleet in the Annual Energy Outlook 2021 over the projection period (2022–2050).

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Table A10. World carbon dioxide emissions by region, Reference case

million metric tons of carbon dioxide

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**6,992**	**6,746**	**6,251**	**6,238**	**6,353**	**6,513**	**6,674**	**-0.2%**
United States	4,842	4,542	3,999	3,891	3,865	3,896	3,938	-0.7%
Canada	548	543	516	534	562	593	624	0.5%
Mexico	419	428	446	459	482	503	526	0.8%
Brazil	439	467	486	490	497	498	503	0.5%
Other Americas	743	765	803	865	947	1,023	1,083	1.4%
Europe and Eurasia	**6,367**	**6,409**	**6,256**	**6,263**	**6,360**	**6,586**	**6,815**	**0.2%**
Western Europe	3,808	3,819	3,657	3,585	3,538	3,608	3,672	-0.1%
Russia	1,817	1,833	1,825	1,862	1,932	2,005	2,077	0.5%
Eastern Europe and Eurasia	742	757	774	816	891	974	1,066	1.3%
Asia Pacific	**18,705**	**19,121**	**20,318**	**21,051**	**21,375**	**21,842**	**22,405**	**0.6%**
Japan	1,039	1,019	864	821	782	762	739	-1.2%
South Korea	639	649	649	648	641	636	630	-0.1%
Australia and New Zealand	404	395	422	433	438	449	461	0.5%
China	11,500	11,530	11,644	11,594	11,150	10,788	10,601	-0.3%
India	2,447	2,677	3,408	3,860	4,328	4,807	5,210	2.7%
Other Asia Pacific	2,676	2,851	3,331	3,695	4,035	4,401	4,765	2.1%
Africa and Middle East	**3,606**	**3,776**	**3,900**	**4,172**	**4,408**	**4,744**	**5,060**	**1.2%**
Africa	1,331	1,380	1,504	1,697	1,837	2,066	2,283	1.9%
Middle East	2,275	2,396	2,397	2,474	2,571	2,678	2,777	0.7%
World	**35,669**	**36,053**	**36,726**	**37,724**	**38,497**	**39,685**	**40,954**	**0.5%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A11. World carbon dioxide emissions from liquid fuels use by region, Reference case

million metric tons of carbon dioxide

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**3,501**	**3,478**	**3,395**	**3,353**	**3,379**	**3,460**	**3,568**	**0.1%**
United States	2,189	2,133	2,060	1,994	1,969	1,982	2,020	-0.3%
Canada	272	272	272	280	289	300	309	0.5%
Mexico	253	254	243	241	247	257	272	0.3%
Brazil	310	326	330	336	343	350	355	0.5%
Other Americas	478	492	490	502	532	570	611	0.9%
Europe and Eurasia	**2,479**	**2,504**	**2,418**	**2,353**	**2,339**	**2,366**	**2,408**	**-0.1%**
Western Europe	1,909	1,911	1,821	1,750	1,715	1,716	1,732	-0.3%
Russia	436	449	446	442	447	455	462	0.2%
Eastern Europe and Eurasia	134	144	151	162	177	195	214	1.7%
Asia Pacific	**4,139**	**4,482**	**4,832**	**5,147**	**5,428**	**5,729**	**5,996**	**1.3%**
Japan	405	389	361	335	319	308	297	-1.1%
South Korea	262	277	274	267	258	251	243	-0.3%
Australia and New Zealand	168	170	175	176	179	184	190	0.4%
China	1,581	1,734	1,826	1,850	1,828	1,818	1,794	0.5%
India	611	707	875	1,078	1,287	1,494	1,688	3.7%
Other Asia Pacific	1,112	1,206	1,321	1,441	1,557	1,674	1,784	1.7%
Africa and Middle East	**1,659**	**1,769**	**1,755**	**1,816**	**1,913**	**2,040**	**2,178**	**1.0%**
Africa	597	642	686	758	838	940	1,052	2.0%
Middle East	1,062	1,127	1,069	1,058	1,075	1,100	1,127	0.2%
World	**11,778**	**12,233**	**12,400**	**12,669**	**13,060**	**13,595**	**14,150**	**0.7%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A12. World carbon dioxide emissions from natural gas use by region, Reference case

million metric tons of carbon dioxide

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**2,405**	**2,293**	**2,267**	**2,264**	**2,352**	**2,435**	**2,517**	**0.2%**
United States	1,724	1,580	1,515	1,482	1,529	1,571	1,607	-0.3%
Canada	231	242	231	240	259	279	301	0.9%
Mexico	147	155	173	183	201	210	218	1.4%
Brazil	72	81	95	89	82	79	79	0.3%
Other Americas	230	236	254	269	281	295	311	1.1%
Europe and Eurasia	**2,318**	**2,362**	**2,439**	**2,503**	**2,607**	**2,719**	**2,849**	**0.7%**
Western Europe	1,086	1,128	1,195	1,188	1,194	1,201	1,221	0.4%
Russia	931	918	935	994	1,051	1,108	1,166	0.8%
Eastern Europe and Eurasia	300	315	309	321	363	409	462	1.6%
Asia Pacific	**1,847**	**1,986**	**2,131**	**2,266**	**2,433**	**2,658**	**2,879**	**1.6%**
Japan	225	229	216	197	185	187	185	-0.7%
South Korea	137	135	130	125	122	121	123	-0.4%
Australia and New Zealand	91	91	94	92	92	97	101	0.4%
China	738	806	870	962	1,075	1,195	1,314	2.1%
India	137	159	213	273	334	397	458	4.4%
Other Asia Pacific	519	567	607	617	624	660	699	1.1%
Africa and Middle East	**1,517**	**1,582**	**1,664**	**1,783**	**1,901**	**2,021**	**2,137**	**1.2%**
Africa	331	339	362	393	432	471	514	1.6%
Middle East	1,186	1,243	1,302	1,390	1,469	1,550	1,623	1.1%
World	**8,087**	**8,223**	**8,501**	**8,815**	**9,294**	**9,833**	**10,382**	**0.9%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A13. World carbon dioxide emissions from coal use by region, Reference case

million metric tons of carbon dioxide

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**1,085**	**975**	**589**	**622**	**621**	**618**	**590**	**-2.2%**
United States	929	830	425	416	368	343	311	-3.8%
Canada	45	29	13	14	14	14	14	-4.2%
Mexico	19	19	30	34	35	35	36	2.4%
Brazil	57	60	61	65	72	68	69	0.6%
Other Americas	35	38	59	94	134	158	161	5.6%
Europe and Eurasia	**1,570**	**1,544**	**1,399**	**1,407**	**1,414**	**1,502**	**1,557**	**0.0%**
Western Europe	813	780	641	646	630	691	719	-0.4%
Russia	449	466	444	427	434	442	449	0.0%
Eastern Europe and Eurasia	308	298	314	334	351	369	389	0.8%
Asia Pacific	**12,719**	**12,653**	**13,355**	**13,638**	**13,513**	**13,456**	**13,530**	**0.2%**
Japan	409	402	287	289	278	267	257	-1.6%
South Korea	240	237	245	255	260	264	264	0.3%
Australia and New Zealand	145	134	153	165	166	168	169	0.6%
China	9,181	8,991	8,948	8,782	8,247	7,774	7,494	-0.7%
India	1,699	1,811	2,320	2,509	2,707	2,916	3,064	2.1%
Other Asia Pacific	1,045	1,078	1,402	1,637	1,854	2,067	2,282	2.8%
Africa and Middle East	**429**	**425**	**481**	**573**	**594**	**682**	**745**	**2.0%**
Africa	403	399	455	547	567	655	718	2.1%
Middle East	26	26	25	26	27	27	27	0.1%
World	**15,804**	**15,597**	**15,824**	**16,240**	**16,143**	**16,258**	**16,422**	**0.1%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A14. World carbon dioxide emissions from power generation by region and fossil fuel type, Reference case

million metric tons of carbon dioxide

Region and fuel	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas								
Liquid fuels	92	109	56	23	11	4	4	-10.7%
Natural gas	852	749	635	573	604	624	634	-1.1%
Coal	907	799	408	439	439	434	403	-2.9%
Total	**1,851**	**1,658**	**1,098**	**1,035**	**1,054**	**1,062**	**1,040**	**-2.0%**
United States								
Liquid fuels	8	8	5	5	4	3	3	-3.2%
Natural gas	646	529	422	367	394	413	424	-1.5%
Coal	842	747	344	340	297	276	244	-4.3%
Total	**1,496**	**1,284**	**771**	**712**	**696**	**693**	**671**	**-2.8%**
Canada								
Liquid fuels	2	2	0	0	0	0	0	-10.3%
Natural gas	27	30	7	2	3	2	2	-8.8%
Coal	33	16	0	0	0	0	0	-100.0%
Total	**61**	**49**	**7**	**2**	**3**	**2**	**2**	**-11.3%**
Mexico								
Liquid fuels	28	36	19	9	3	0	0	-18.4%
Natural gas	70	73	76	81	92	95	96	1.1%
Coal	7	8	18	21	21	21	21	4.1%
Total	**105**	**117**	**114**	**111**	**116**	**116**	**118**	**0.4%**
Brazil								
Liquid fuels	10	14	6	1	0	0	0	-14.8%
Natural gas	28	36	46	37	29	27	25	-0.4%
Coal	9	10	8	9	14	9	9	0.1%
Total	**47**	**60**	**60**	**46**	**43**	**36**	**34**	**-1.2%**
Other Americas								
Liquid fuels	44	50	25	8	3	0	0	-17.4%
Natural gas	81	80	84	86	86	86	86	0.3%
Coal	17	19	38	69	107	128	128	7.4%
Total	**142**	**149**	**147**	**164**	**196**	**215**	**215**	**1.5%**
Europe and Eurasia								
Liquid fuels	58	80	81	55	42	41	39	-1.4%
Natural gas	701	706	750	771	819	868	920	1.0%
Coal	848	815	663	649	629	690	714	-0.6%
Total	**1,607**	**1,601**	**1,493**	**1,476**	**1,491**	**1,598**	**1,673**	**0.1%**
Western Europe								
Liquid fuels	40	57	62	47	35	35	35	-0.5%
Natural gas	263	297	365	353	346	341	338	0.9%
Coal	481	453	323	326	308	368	392	-0.7%
Total	**784**	**807**	**749**	**726**	**689**	**743**	**764**	**-0.1%**
Russia								
Liquid fuels	13	19	16	5	4	3	2	-6.8%
Natural gas	315	295	290	323	349	371	390	0.8%
Coal	179	192	166	143	142	142	142	-0.8%
Total	**508**	**507**	**472**	**471**	**495**	**516**	**534**	**0.2%**
Eastern Europe and Eurasia								
Liquid fuels	4	4	3	3	3	3	3	-1.3%
Natural gas	123	113	95	95	125	156	192	1.6%
Coal	187	170	174	180	180	180	180	-0.1%
Total	**315**	**286**	**272**	**279**	**308**	**339**	**375**	**0.6%**
Asia Pacific								

Liquid fuels	49	55	33	18	10	7	6	-7.4%
Natural gas	618	656	653	641	673	751	827	1.0%
Coal	7,386	7,346	8,075	8,401	8,328	8,273	8,351	0.4%
Total	**8,052**	**8,057**	**8,760**	**9,059**	**9,011**	**9,031**	**9,183**	**0.5%**
Japan								
Liquid fuels	9	13	9	5	3	3	3	-4.0%
Natural gas	145	145	134	117	105	106	103	-1.2%
Coal	251	249	147	162	162	162	162	-1.6%
Total	**406**	**406**	**290**	**284**	**270**	**271**	**267**	**-1.5%**
South Korea								
Liquid fuels	2	3	4	3	2	2	2	0.5%
Natural gas	69	65	60	55	50	48	48	-1.3%
Coal	130	129	134	143	147	150	150	0.5%
Total	**202**	**197**	**198**	**200**	**200**	**200**	**200**	**0.0%**
Australia and New Zealand								
Liquid fuels	1	1	0	0	0	0	0	-7.3%
Natural gas	22	21	23	18	14	15	15	-1.4%
Coal	123	111	127	138	138	139	139	0.4%
Total	**145**	**133**	**150**	**156**	**153**	**154**	**154**	**0.2%**
China								
Liquid fuels	2	2	1	0	0	0	0	-11.0%
Natural gas	121	148	158	202	279	358	437	4.7%
Coal	5,206	5,118	5,324	5,439	5,191	4,959	4,917	-0.2%
Total	**5,328**	**5,268**	**5,482**	**5,642**	**5,470**	**5,318**	**5,354**	**0.0%**
India								
Liquid fuels	3	2	1	0	0	0	0	-14.5%
Natural gas	24	24	29	29	29	29	29	0.7%
Coal	1,077	1,146	1,492	1,498	1,516	1,535	1,489	1.2%
Total	**1,104**	**1,172**	**1,521**	**1,528**	**1,546**	**1,564**	**1,518**	**1.1%**
Other Asia Pacific								
Liquid fuels	33	34	18	10	5	2	0	-14.5%
Natural gas	237	254	249	219	195	195	195	-0.7%
Coal	598	593	851	1,020	1,173	1,328	1,494	3.3%
Total	**867**	**880**	**1,118**	**1,249**	**1,372**	**1,525**	**1,689**	**2.4%**
Africa and Middle East								
Liquid fuels	205	230	119	55	21	8	2	-15.2%
Natural gas	587	612	632	688	722	758	791	1.1%
Coal	212	187	210	263	237	269	270	0.9%
Total	**1,004**	**1,029**	**962**	**1,006**	**980**	**1,035**	**1,063**	**0.2%**
Africa								
Liquid fuels	31	31	12	7	0	0	0	-16.3%
Natural gas	166	167	172	181	194	207	224	1.1%
Coal	212	186	210	263	237	269	270	0.9%
Total	**409**	**384**	**394**	**451**	**431**	**476**	**494**	**0.7%**
Middle East								
Liquid fuels	174	200	107	48	21	8	2	-15.0%
Natural gas	421	445	461	507	528	551	567	1.1%
Coal	0	0	0	0	0	0	0	-5.9%
Total	**595**	**645**	**568**	**555**	**549**	**559**	**569**	**-0.2%**
World								
Liquid fuels	404	475	288	152	84	60	51	-7.1%
Natural gas	2,757	2,723	2,670	2,673	2,818	3,001	3,172	0.5%
Coal	9,353	9,147	9,355	9,752	9,633	9,666	9,737	0.1%
Total	**12,514**	**12,345**	**12,313**	**12,577**	**12,535**	**12,727**	**12,959**	**0.1%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo

Note: Totals may not equal sum of components due to independent rounding.

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Table A15. World population by region, Reference case

million persons

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**1,036**	**1,057**	**1,091**	**1,120**	**1,143**	**1,161**	**1,175**	**0.4%**
United States	333	338	346	354	361	367	372	0.4%
Canada	39	40	43	45	47	48	50	0.9%
Mexico	128	130	135	138	141	143	144	0.4%
Brazil	216	219	224	228	230	231	231	0.2%
Other Americas	320	330	343	355	364	372	378	0.6%
Europe and Eurasia	**920**	**923**	**928**	**932**	**934**	**935**	**933**	**0.1%**
Western Europe	633	636	639	641	641	641	638	0.0%
Russia	144	143	141	138	136	134	132	-0.3%
Eastern Europe and Eurasia	142	144	149	152	156	160	162	0.5%
Asia Pacific	**4,287**	**4,358**	**4,474**	**4,568**	**4,640**	**4,690**	**4,712**	**0.3%**
Japan	126	124	121	117	114	110	106	-0.6%
South Korea	52	52	51	51	49	48	46	-0.4%
Australia and New Zealand	31	33	35	37	39	40	42	1.1%
China	1,427	1,424	1,415	1,399	1,377	1,349	1,312	-0.3%
India	1,422	1,456	1,516	1,569	1,613	1,647	1,671	0.6%
Other Asia Pacific	1,229	1,270	1,335	1,396	1,449	1,496	1,535	0.8%
Africa and Middle East	**1,658**	**1,772**	**1,968**	**2,170**	**2,375**	**2,581**	**2,784**	**1.9%**
Africa	1,386	1,486	1,661	1,843	2,031	2,221	2,410	2.0%
Middle East	273	287	308	326	344	360	374	1.1%
World	**7,901**	**8,111**	**8,462**	**8,789**	**9,093**	**9,366**	**9,603**	**0.7%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; Oxford Economics, Global Economic Model (February 2023), www.oxfordeconomics.com (subscription site)

Note: Totals may not equal sum of components due to independent rounding.

International Energy Outlook 2023

Release date: October 2023

Table A16. World gross output by region and sector, Reference case

billion 2015 dollars

Region and sector	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas								
Energy-intensive manufacturing	$4,946	$5,117	$5,626	$6,047	$6,509	$7,031	$7,587	1.5%
Non-energy-intensive manufacturing	$6,357	$6,791	$7,652	$8,490	$9,463	$10,546	$11,756	2.2%
Nonmanufacturing	$5,265	$5,624	$6,107	$6,660	$7,278	$7,948	$8,666	1.8%
Services	$40,510	$43,142	$47,648	$52,185	$57,343	$62,963	$68,991	1.9%
Total	**$57,077**	**$60,673**	**$67,034**	**$73,383**	**$80,592**	**$88,488**	**$97,000**	**1.9%**
United States								
Energy-intensive manufacturing	$2,388	$2,427	$2,621	$2,773	$2,988	$3,249	$3,531	1.4%
Non-energy-intensive manufacturing	$3,493	$3,789	$4,277	$4,756	$5,372	$6,072	$6,856	2.4%
Nonmanufacturing	$2,394	$2,632	$2,830	$3,104	$3,462	$3,874	$4,329	2.1%
Services	$28,881	$30,845	$33,791	$36,867	$40,647	$44,897	$49,543	1.9%
Total	**$37,155**	**$39,692**	**$43,519**	**$47,500**	**$52,469**	**$58,091**	**$64,260**	**2.0%**
Canada								
Energy-intensive manufacturing	$256	$266	$306	$341	$376	$414	$451	2.0%
Non-energy-intensive manufacturing	$332	$359	$413	$458	$503	$549	$595	2.1%
Nonmanufacturing	$498	$500	$539	$584	$626	$667	$708	1.3%
Services	$1,724	$1,830	$2,073	$2,270	$2,482	$2,707	$2,951	1.9%
Total	**$2,810**	**$2,954**	**$3,332**	**$3,653**	**$3,988**	**$4,337**	**$4,705**	**1.9%**
Mexico								
Energy-intensive manufacturing	$535	$557	$618	$670	$722	$786	$866	1.7%
Non-energy-intensive manufacturing	$983	$1,048	$1,142	$1,247	$1,373	$1,527	$1,723	2.0%
Nonmanufacturing	$466	$490	$537	$577	$609	$640	$670	1.3%
Services	$1,999	$2,095	$2,326	$2,566	$2,806	$3,049	$3,294	1.8%
Total	**$3,982**	**$4,191**	**$4,624**	**$5,059**	**$5,511**	**$6,003**	**$6,553**	**1.8%**
Brazil								
Energy-intensive manufacturing	$868	$910	$997	$1,054	$1,078	$1,095	$1,102	0.9%
Non-energy-intensive manufacturing	$612	$660	$752	$827	$878	$922	$958	1.6%
Nonmanufacturing	$710	$748	$817	$873	$915	$956	$994	1.2%
Services	$3,392	$3,568	$3,940	$4,221	$4,376	$4,483	$4,536	1.0%
Total	**$5,583**	**$5,886**	**$6,506**	**$6,974**	**$7,247**	**$7,455**	**$7,591**	**1.1%**
Other Americas								
Energy-intensive manufacturing	$899	$956	$1,084	$1,210	$1,344	$1,486	$1,636	2.2%
Non-energy-intensive manufacturing	$937	$935	$1,068	$1,201	$1,338	$1,476	$1,624	2.0%
Nonmanufacturing	$1,197	$1,254	$1,384	$1,523	$1,666	$1,811	$1,965	1.8%
Services	$4,514	$4,804	$5,519	$6,262	$7,032	$7,829	$8,666	2.4%
Total	**$7,546**	**$7,950**	**$9,053**	**$10,196**	**$11,379**	**$12,602**	**$13,891**	**2.2%**
Europe and Eurasia								
Energy-intensive manufacturing	$6,107	$6,281	$6,475	$6,800	$7,188	$7,603	$8,057	1.0%
Non-energy-intensive manufacturing	$9,080	$9,661	$10,291	$11,056	$11,891	$12,760	$13,681	1.5%
Nonmanufacturing	$6,410	$6,609	$7,168	$7,598	$8,038	$8,441	$8,844	1.2%
Services	$36,030	$37,800	$40,910	$43,842	$47,101	$50,630	$54,531	1.5%
Total	**$57,627**	**$60,351**	**$64,844**	**$69,296**	**$74,218**	**$79,434**	**$85,114**	**1.4%**
Western Europe								
Energy-intensive manufacturing	$4,982	$5,027	$5,106	$5,290	$5,517	$5,752	$6,026	0.7%
Non-energy-intensive manufacturing	$8,440	$8,935	$9,511	$10,207	$10,955	$11,723	$12,538	1.4%
Nonmanufacturing	$4,377	$4,532	$4,829	$5,078	$5,328	$5,548	$5,773	1.0%
Services	$31,098	$32,470	$35,049	$37,350	$39,813	$42,373	$45,095	1.3%
Total	**$48,897**	**$50,963**	**$54,494**	**$57,924**	**$61,613**	**$65,395**	**$69,433**	**1.3%**
Russia								
Energy-intensive manufacturing	$895	$988	$1,054	$1,135	$1,221	$1,313	$1,395	1.6%
Non-energy-intensive manufacturing	$544	$607	$637	$683	$744	$813	$882	1.7%

Nonmanufacturing	$1,282	$1,252	$1,312	$1,333	$1,346	$1,363	$1,377	0.3%
Services	$3,823	$4,069	$4,254	$4,389	$4,570	$4,801	$5,087	1.0%
Total	**$6,544**	**$6,916**	**$7,258**	**$7,540**	**$7,881**	**$8,289**	**$8,741**	**1.0%**
Eastern Europe and Eurasia								
Energy-intensive manufacturing	$230	$266	$314	$376	$450	$538	$635	3.7%
Non-energy-intensive manufacturing	$96	$119	$143	$165	$192	$225	$261	3.6%
Nonmanufacturing	$750	$825	$1,028	$1,188	$1,364	$1,531	$1,694	3.0%
Services	$1,109	$1,261	$1,607	$2,103	$2,718	$3,457	$4,349	5.0%
Total	**$2,185**	**$2,472**	**$3,092**	**$3,832**	**$4,724**	**$5,750**	**$6,940**	**4.2%**
Asia Pacific								
Energy-intensive manufacturing	$21,179	$23,849	$28,153	$32,544	$36,786	$41,263	$45,614	2.8%
Non-energy-intensive manufacturing	$42,102	$47,921	$57,364	$65,981	$73,216	$79,875	$85,020	2.5%
Nonmanufacturing	$24,048	$26,248	$30,795	$34,704	$38,180	$41,672	$44,649	2.2%
Services	$58,764	$67,673	$85,858	$104,584	$123,304	$142,968	$161,808	3.7%
Total	**$146,093**	**$165,690**	**$202,171**	**$237,812**	**$271,487**	**$305,778**	**$337,090**	**3.0%**
Japan								
Energy-intensive manufacturing	$941	$965	$938	$906	$885	$864	$848	-0.4%
Non-energy-intensive manufacturing	$2,737	$3,005	$3,154	$3,215	$3,242	$3,261	$3,287	0.7%
Nonmanufacturing	$670	$682	$700	$697	$693	$687	$684	0.1%
Services	$5,761	$5,988	$6,190	$6,201	$6,219	$6,236	$6,280	0.3%
Total	**$10,110**	**$10,640**	**$10,983**	**$11,019**	**$11,039**	**$11,048**	**$11,098**	**0.3%**
South Korea								
Energy-intensive manufacturing	$1,067	$1,123	$1,151	$1,160	$1,142	$1,117	$1,087	0.1%
Non-energy-intensive manufacturing	$1,692	$1,796	$2,032	$2,169	$2,257	$2,341	$2,421	1.3%
Nonmanufacturing	$362	$376	$384	$395	$400	$405	$408	0.4%
Services	$2,565	$2,716	$2,930	$3,092	$3,181	$3,265	$3,335	0.9%
Total	**$5,686**	**$6,010**	**$6,497**	**$6,816**	**$6,980**	**$7,128**	**$7,251**	**0.9%**
Australia and New Zealand								
Energy-intensive manufacturing	$173	$187	$204	$218	$233	$247	$260	1.5%
Non-energy-intensive manufacturing	$130	$137	$148	$158	$168	$176	$183	1.2%
Nonmanufacturing	$590	$626	$728	$805	$875	$941	$1,004	1.9%
Services	$1,958	$2,123	$2,454	$2,752	$3,026	$3,290	$3,557	2.2%
Total	**$2,852**	**$3,073**	**$3,533**	**$3,934**	**$4,302**	**$4,654**	**$5,004**	**2.0%**
China								
Energy-intensive manufacturing	$10,799	$12,197	$13,638	$14,681	$15,316	$15,841	$16,047	1.4%
Non-energy-intensive manufacturing	$25,771	$29,891	$35,508	$40,339	$43,701	$46,402	$47,583	2.2%
Nonmanufacturing	$12,744	$13,871	$15,868	$17,316	$18,362	$19,421	$20,069	1.6%
Services	$25,046	$29,138	$37,757	$46,710	$55,068	$63,731	$71,228	3.8%
Total	**$74,360**	**$85,097**	**$102,771**	**$119,046**	**$132,447**	**$145,395**	**$154,927**	**2.7%**
India								
Energy-intensive manufacturing	$3,724	$4,306	$6,024	$8,083	$10,245	$12,625	$15,118	5.1%
Non-energy-intensive manufacturing	$3,007	$3,410	$4,770	$6,344	$8,043	$9,898	$11,871	5.0%
Nonmanufacturing	$4,474	$5,019	$6,312	$7,616	$8,820	$10,043	$11,199	3.3%
Services	$7,664	$9,685	$13,873	$18,558	$23,632	$29,119	$34,878	5.6%
Total	**$18,869**	**$22,419**	**$30,979**	**$40,601**	**$50,740**	**$61,685**	**$73,066**	**5.0%**
Other Asia Pacific								
Energy-intensive manufacturing	$4,475	$5,072	$6,198	$7,495	$8,966	$10,568	$12,255	3.7%
Non-energy-intensive manufacturing	$8,764	$9,681	$11,752	$13,756	$15,806	$17,797	$19,675	2.9%
Nonmanufacturing	$5,207	$5,674	$6,802	$7,876	$9,030	$10,174	$11,285	2.8%
Services	$15,770	$18,024	$22,656	$27,270	$32,178	$37,327	$42,530	3.6%
Total	**$34,217**	**$38,451**	**$47,408**	**$56,397**	**$65,979**	**$75,867**	**$85,744**	**3.3%**
Africa and Middle East								
Energy-intensive manufacturing	$2,921	$3,129	$3,512	$3,958	$4,396	$4,833	$5,275	2.1%
Non-energy-intensive manufacturing	$1,721	$1,867	$2,124	$2,428	$2,741	$3,048	$3,353	2.4%
Nonmanufacturing	$5,582	$6,016	$6,561	$7,102	$7,642	$8,167	$8,657	1.6%
Services	$12,133	$13,192	$15,223	$17,351	$19,370	$21,244	$22,999	2.3%
Total	**$22,357**	**$24,204**	**$27,420**	**$30,838**	**$34,149**	**$37,293**	**$40,284**	**2.1%**
Africa								

Energy-intensive manufacturing	$1,364	$1,503	$1,761	$2,051	$2,361	$2,695	$3,051	2.9%
Non-energy-intensive manufacturing	$885	$975	$1,136	$1,313	$1,501	$1,700	$1,900	2.8%
Nonmanufacturing	$3,002	$3,248	$3,607	$3,980	$4,353	$4,720	$5,077	1.9%
Services	$6,408	$6,816	$8,003	$9,210	$10,436	$11,688	$12,944	2.5%
Total	**$11,659**	**$12,543**	**$14,507**	**$16,554**	**$18,651**	**$20,804**	**$22,972**	**2.5%**
Middle East								
Energy-intensive manufacturing	$1,557	$1,626	$1,751	$1,907	$2,034	$2,138	$2,223	1.3%
Non-energy-intensive manufacturing	$836	$892	$988	$1,115	$1,241	$1,348	$1,453	2.0%
Nonmanufacturing	$2,580	$2,768	$2,954	$3,122	$3,289	$3,447	$3,580	1.2%
Services	$5,725	$6,375	$7,220	$8,141	$8,934	$9,557	$10,055	2.0%
Total	**$10,697**	**$11,661**	**$12,912**	**$14,284**	**$15,498**	**$16,489**	**$17,311**	**1.7%**
World								
Energy-intensive manufacturing	$35,153	$38,376	$43,766	$49,349	$54,879	$60,729	$66,533	2.3%
Non-energy-intensive manufacturing	$59,259	$66,239	$77,431	$87,954	$97,312	$106,230	$113,809	2.4%
Nonmanufacturing	$41,304	$44,497	$50,632	$56,064	$61,138	$66,228	$70,817	1.9%
Services	$147,437	$161,807	$189,640	$217,961	$247,118	$277,806	$308,329	2.7%
Total	**$283,153**	**$310,919**	**$361,469**	**$411,328**	**$460,447**	**$510,993**	**$559,488**	**2.5%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; Oxford Economics, Global Industry Model (March 2023), www.oxfordeconomics.com (subscription site)

Note: Totals may not equal sum of components due to independent rounding. Gross output is sales or revenue, including final and intermediate goods and services, measured in purchasing power parity. Nonmanufacturing includes agriculture, construction, and mining; energy-intensive manufacturing includes food, pulp and paper, basic chemicals, refining, iron and steel, nonferrous metals, and nonmetallic minerals; non-energy-intensive manufacturing includes all other manufacturing industries; services includes all other non-industrial output.

International Energy Outlook 2023

Release date: October 2023

Table A17. World employment by region, Reference case

million persons

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**467**	**487**	**504**	**519**	**531**	**541**	**547**	**0.6%**
United States	158	162	165	169	174	178	182	0.5%
Canada	20	20	21	23	23	24	25	0.9%
Mexico	57	59	62	64	66	67	68	0.6%
Brazil	98	102	105	106	106	104	102	0.1%
Other Americas	134	144	151	157	162	167	171	0.9%
Europe and Eurasia	**415**	**418**	**421**	**419**	**416**	**410**	**403**	**-0.1%**
Western Europe	289	291	293	291	288	285	282	-0.1%
Russia	72	71	70	69	67	64	60	-0.6%
Eastern Europe and Eurasia	54	55	58	59	60	61	60	0.4%
Asia Pacific	**1,855**	**1,920**	**1,983**	**2,027**	**2,044**	**2,058**	**2,052**	**0.4%**
Japan	67	68	65	62	57	53	50	-1.0%
South Korea	28	28	28	26	25	23	21	-1.0%
Australia and New Zealand	16	17	19	20	21	22	23	1.2%
China	750	758	754	741	706	675	633	-0.6%
India	481	508	548	584	620	654	683	1.3%
Other Asia Pacific	512	541	570	594	615	631	641	0.8%
Africa and Middle East	**547**	**593**	**671**	**756**	**841**	**928**	**1,015**	**2.2%**
Africa	470	511	584	663	744	829	914	2.4%
Middle East	77	82	87	93	97	99	101	1.0%
World	**3,283**	**3,417**	**3,579**	**3,721**	**3,832**	**3,937**	**4,016**	**0.7%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; Oxford Economics, Global Economic Model (February 2023), www.oxfordeconomics.com (subscription site)

Note: Totals may not equal sum of components due to independent rounding.

International Energy Outlook 2023

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Table A18. World disposable income per capita by region, Reference case

2015 dollars per person (PPP)

Region	2022	2025	2030	2035	2040	2045	2050	Average annual percentage change, 2022–2050
Americas	**$21,783**	**$22,272**	**$23,240**	**$24,485**	**$25,863**	**$27,367**	**$28,930**	**1.0%**
United States	$46,720	$49,193	$51,549	$54,303	$57,611	$61,211	$64,767	1.2%
Canada	$27,994	$28,073	$29,553	$31,271	$32,979	$34,714	$36,517	1.0%
Mexico	$16,588	$15,608	$16,541	$17,613	$18,714	$19,950	$21,386	0.9%
Brazil	$11,919	$11,582	$11,790	$12,435	$12,810	$13,134	$13,426	0.4%
Other Americas	$3,825	$3,709	$4,001	$4,280	$4,532	$4,765	$5,003	1.0%
Europe and Eurasia	**$20,359**	**$20,755**	**$21,974**	**$23,342**	**$24,885**	**$26,568**	**$28,491**	**1.2%**
Western Europe	$24,026	$24,232	$25,371	$26,684	$28,199	$29,821	$31,654	1.0%
Russia	$15,436	$16,287	$17,939	$19,155	$20,257	$21,443	$22,753	1.4%
Eastern Europe and Eurasia	$9,016	$9,839	$11,192	$13,089	$15,312	$17,830	$20,742	3.0%
Asia Pacific	**$8,187**	**$9,145**	**$11,152**	**$13,277**	**$15,417**	**$17,720**	**$20,019**	**3.2%**
Japan	$22,970	$24,037	$25,237	$25,959	$26,813	$27,725	$28,785	0.8%
South Korea	$22,258	$22,960	$24,501	$26,298	$27,739	$29,327	$31,184	1.2%
Australia and New Zealand	$32,814	$32,360	$35,480	$37,660	$39,326	$40,768	$42,183	0.9%
China	$10,529	$12,236	$15,484	$19,156	$22,902	$27,107	$31,383	4.0%
India	$5,497	$6,308	$8,264	$10,438	$12,683	$15,101	$17,609	4.2%
Other Asia Pacific	$5,851	$6,319	$7,421	$8,397	$9,399	$10,410	$11,386	2.4%
Africa and Middle East	**$2,228**	**$2,283**	**$2,402**	**$2,520**	**$2,652**	**$2,791**	**$2,931**	**1.0%**
Africa	$1,652	$1,703	$1,824	$1,952	$2,088	$2,229	$2,375	1.3%
Middle East	$5,155	$5,290	$5,525	$5,728	$5,983	$6,255	$6,515	0.8%
World	**$10,136**	**$10,677**	**$11,862**	**$13,116**	**$14,368**	**$15,685**	**$16,979**	**1.9%**

Data source: U.S. Energy Information Administration, World Energy Projection System (2023), run r_230822.081459 and Annual Energy Outlook 2023 (March 2023), www.eia.gov/aeo; Oxford Economics, Global Economic Model (February 2023), www.oxfordeconomics.com (subscription site)

Note: Totals may not equal sum of components due to independent rounding. PPP=purchasing power parity.