

Appendix J
Kaya Identify factor projection

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Table J1. World carbon dioxide intensity of energy use by region, 2015-50

metric tons per billion Btu

Region	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
OECD									
OECD Americas	52.0	51.0	49.2	47.8	47.3	46.9	46.7	46.6	-0.3
United States /a	53.8	52.5	50.2	48.8	48.4	47.9	47.6	47.4	-0.4
Canada	39.0	38.8	39.4	38.4	38.3	38.6	38.9	39.2	0.0
Mexico and Chile	54.1	54.2	54.3	52.3	50.1	50.0	50.0	49.7	-0.2
OECD Europe	48.4	48.8	47.1	45.8	46.0	45.7	46.2	46.6	-0.1
OECD Asia	58.4	55.9	53.5	52.7	52.3	51.8	51.4	51.0	-0.4
Japan	58.8	55.9	53.6	53.5	53.0	52.6	52.1	51.7	-0.4
South Korea	56.7	54.9	52.4	51.1	51.0	51.0	51.1	51.3	-0.3
Australia and New Zealand	60.1	57.5	55.2	54.0	52.7	51.6	50.5	49.7	-0.5
Total OECD	51.8	51.0	49.2	48.0	47.7	47.4	47.3	47.4	-0.3
Non-OECD									
Non-OECD Europe and Eurasia	56.4	55.4	54.4	54.0	54.1	53.9	53.5	52.9	-0.2
Russia	55.4	54.1	53.1	53.0	53.2	53.2	53.0	52.7	-0.1
Other	58.1	57.7	56.8	55.7	55.6	54.9	54.3	53.1	-0.3
Non-OECD Asia	71.4	68.4	66.4	63.7	62.1	60.5	59.3	58.2	-0.6
China	74.6	69.7	67.1	64.6	61.7	58.9	56.3	53.9	-0.9
India	70.4	69.3	67.1	65.2	65.3	65.2	65.7	65.9	-0.2
Other	61.4	63.0	63.4	59.9	60.3	60.3	60.3	60.4	0.0
Middle East	57.8	57.3	56.2	55.4	54.9	54.6	54.6	54.5	-0.2
Africa	55.1	56.5	56.7	54.0	51.4	50.8	50.9	51.1	-0.2
Non-OECD Americas	40.9	41.0	40.5	39.8	39.2	39.3	39.6	39.7	-0.1
Brazil	32.5	31.8	31.2	30.8	30.3	30.2	30.3	30.4	-0.2
Other	48.7	49.4	49.6	48.7	47.8	48.2	48.3	48.4	0.0
Total Non-OECD	64.0	62.4	61.0	59.1	57.8	56.7	55.9	55.2	-0.4
Total World	58.9	57.8	56.4	54.9	54.1	53.4	53.0	52.6	-0.3

a/ Includes the 50 states and the District of Columbia.

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

Sources: U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156 and EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo.

Table J2. World energy intensity by region, 2015-50

thousand Btu per 2010 dollar of GDP (PPP)

Region	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
OECD									
OECD Americas	6.0	5.5	4.9	4.5	4.1	3.8	3.5	3.3	-1.7
United States /a	5.9	5.5	4.9	4.4	4.0	3.6	3.4	3.2	-1.8
Canada	10.0	9.3	8.6	8.1	7.7	7.4	7.3	7.2	-1.0
Mexico and Chile	3.8	3.4	3.1	2.9	2.8	2.7	2.6	2.5	-1.2
OECD Europe	4.0	3.8	3.5	3.4	3.2	3.1	3.0	2.9	-0.9
OECD Asia	5.1	4.9	4.8	4.7	4.6	4.6	4.5	4.4	-0.4
Japan	4.3	4.1	4.1	4.0	3.9	3.9	3.9	3.8	-0.3
South Korea	6.9	6.6	6.3	6.1	6.0	5.9	5.7	5.6	-0.6
Australia and New Zealand	5.7	5.2	5.0	4.7	4.5	4.3	4.2	4.1	-1.0
Total OECD	5.0	4.7	4.3	4.1	3.8	3.6	3.5	3.3	-1.2
Non-OECD									
Non-OECD Europe and Eurasia	8.6	7.9	7.2	6.6	6.1	5.6	5.3	5.0	-1.6
Russia	8.8	8.1	7.7	7.2	6.6	6.2	5.9	5.7	-1.2
Other	8.3	7.5	6.6	5.9	5.3	4.8	4.5	4.2	-2.0
Non-OECD Asia	5.7	4.8	4.1	3.6	3.2	3.0	2.8	2.6	-2.2
China	7.3	6.1	5.1	4.3	3.7	3.3	3.0	2.8	-2.7
India	3.9	3.2	2.8	2.6	2.5	2.4	2.4	2.4	-1.4
Other	4.1	3.6	3.3	3.1	2.9	2.8	2.7	2.6	-1.3
Middle East	7.1	6.4	5.8	5.4	5.1	4.9	4.8	4.7	-1.2
Africa	4.1	3.8	3.2	2.9	2.7	2.4	2.2	2.0	-2.1
Non-OECD Americas	4.9	4.5	4.2	4.0	3.8	3.7	3.6	3.5	-0.9
Brazil	5.0	4.7	4.6	4.6	4.5	4.5	4.5	4.5	-0.3
Other	4.8	4.3	3.8	3.6	3.4	3.2	3.0	2.9	-1.4
Total Non-OECD	5.9	5.1	4.4	3.9	3.5	3.3	3.0	2.9	-2.0
Total World	5.5	4.9	4.4	4.0	3.6	3.4	3.2	3.0	-1.7

a/ Includes the 50 states and the District of Columbia.

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

Sources: United States: EIA, Annual Energy Outlook 2017, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo; Other countries: Oxford Economic Model (March 2017), www.oxfordeconomics.com (subscription site) and U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156.

Table J3. Gross domestic product per capita expressed in purchasing power parity, 2015-50

2010 dollars per person

Region	2015	2020	2025	2030	2035	2040	2045	2050	Averag annual percent change (2015-50)
OECD									
OECD Americas	40,656	43,064	46,490	49,299	52,903	57,001	61,238	65,341	1.4
United States /a	50,927	54,432	59,103	62,757	67,567	73,165	78,960	84,390	1.5
Canada	42,485	43,803	45,612	47,066	48,478	49,656	50,524	51,098	0.5
Mexico and Chile	17,098	17,822	19,291	20,854	22,567	24,246	25,936	27,842	1.4
OECD Europe	34,754	36,758	39,232	41,567	43,945	46,422	48,941	52,092	1.2
OECD Asia	36,366	38,723	41,352	43,483	45,669	47,951	50,781	54,164	1.1
Japan	35,772	37,435	39,279	40,267	41,246	41,870	42,744	43,988	0.6
South Korea	34,063	37,778	41,981	45,755	49,096	53,002	57,950	63,715	1.8
Australia and New Zealand	43,186	45,700	48,246	51,276	54,960	59,111	63,646	68,596	1.3
Total OECD	37,331	39,585	42,513	45,060	47,972	51,164	54,530	58,202	1.3
Non-OECD									
Non-OECD Europe and Eurasia	16,466	18,038	19,776	21,897	24,611	27,150	29,453	31,665	1.9
Russia	23,937	25,734	27,520	30,096	33,616	36,452	38,526	39,896	1.5
Other	10,901	12,305	14,041	15,873	18,063	20,450	22,963	25,800	2.5
Non-OECD Asia	9,228	11,599	14,166	16,879	19,756	22,789	25,879	28,780	3.3
China	13,262	17,211	21,562	26,389	31,591	37,065	42,801	48,195	3.8
India	5,654	7,475	9,294	11,165	13,173	15,307	17,358	19,063	3.5
Other	8,433	9,781	11,487	13,264	15,189	17,349	19,688	22,312	2.8
Middle East	21,145	23,446	25,811	28,357	30,910	33,114	35,422	37,144	1.6
Africa	4,804	5,002	5,480	6,015	6,646	7,377	8,206	9,155	1.9
Non-OECD Americas	13,123	13,639	15,130	16,270	17,505	18,918	20,472	22,114	1.5
Brazil	14,380	14,613	16,062	16,873	17,709	18,692	19,695	20,707	1.0
Other	12,192	12,923	14,453	15,838	17,360	19,077	21,009	23,076	1.8
Total Non-OECD	9,551	11,220	13,111	15,051	17,087	19,167	21,247	23,168	2.6
Total World	14,432	16,086	18,036	19,965	22,036	24,187	26,361	28,446	2.0

a/ Includes the 50 states and the District of Columbia.

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

Sources: United States: EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo; Other countries: Oxford Economic Model (March 2017), www.oxfordeconomics.com (subscription site) and U.S. Energy Information Administration (EIA), World Energy Projection System Plus (2017), run IEO2017_d2017.08.23_153156.

Table J4. World population by region, 2015-50

millions

Region	2015	2020	2025	2030	2035	2040	2045	2050	Average annual percent change (2015-50)
OECD									
OECD Americas	501	524	547	568	586	603	617	630	0.7
United States /a	322	335	348	360	371	381	390	399	0.6
Canada	36	37	39	41	42	44	45	47	0.8
Mexico and Chile	143	152	160	167	173	178	182	185	0.7
OECD Europe	569	582	590	595	600	603	604	603	0.2
OECD Asia	205	207	208	208	207	206	204	201	0.0
Japan	127	125	123	121	118	114	111	108	-0.5
South Korea	50	51	52	52	53	53	52	51	0.0
Australia and New Zealand	28	30	32	35	37	39	41	43	1.2
Total OECD	1,275	1,313	1,344	1,371	1,393	1,411	1,425	1,435	0.3
Non-OECD									
Non-OECD Europe and Eurasia	336	335	333	329	324	319	314	310	-0.2
Russia	143	143	142	139	136	133	131	129	-0.3
Other	193	192	191	190	187	185	183	181	-0.2
Non-OECD Asia	3,791	3,972	4,129	4,261	4,370	4,457	4,521	4,564	0.5
China	1,369	1,398	1,413	1,416	1,410	1,398	1,379	1,354	0.0
India	1,295	1,374	1,447	1,515	1,574	1,625	1,666	1,699	0.8
Other	1,127	1,200	1,268	1,330	1,385	1,434	1,476	1,510	0.8
Middle East	225	243	259	275	290	304	318	330	1.1
Africa	1,144	1,284	1,433	1,589	1,756	1,932	2,114	2,301	2.0
Non-OECD Americas	484	507	527	545	559	571	580	586	0.5
Brazil	206	214	222	228	232	236	238	238	0.4
Other	278	292	305	317	327	336	343	348	0.6
Total Non-OECD	5,980	6,341	6,681	6,998	7,298	7,582	7,847	8,090	0.9
Total World	7,254	7,654	8,025	8,369	8,691	8,993	9,272	9,525	0.8

a/ Includes the 50 states and the District of Columbia.

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

Sources: United States: EIA, *Annual Energy Outlook 2017*, DOE/EIA-0383(2017) (Washington, DC: January 2017); AEO2017 National Energy Modeling System, run ref2017.d120816a, www.eia.gov/aeo; Other countries: Oxford Economic Model (March 2017), www.oxfordeconomics.com (subscription site).