

Reference	Published Method	Geography	Scenario name	Estimate year	Value (TWh)	Pinpoint	Notes
Koomey, 2007a	2007 Bottom-up	USA	Historical estimate	2003	35.0	Table 6	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007a	2007 Bottom-up	Global	Historical estimate	2003	90.0	Table 6	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007a	2007 Bottom-up	USA	Historical estimate	2004	40.0	Table 6	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007a	2007 Bottom-up	Global	Historical estimate	2004	109.0	Table 6	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007a	2007 Bottom-up	USA	Historical estimate	2005	45.0	Table 6	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007a	2007 Bottom-up	Global	Historical estimate	2005	123.0	Table 6	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Brown et al., 2007	2007 Bottom-up	USA	Historical estimate	2006	61.4	Figure 2-2	Total electricity consumption, including storage and network.
Brown et al., 2007	2007 Bottom-up	USA	Projection: Historical trends	2011	124.5	Table 3-7	Total electricity consumption, including storage and network.
Brown et al., 2007	2007 Bottom-up	USA	Projection: Current efficiency trends	2011	107.4	Table 3-7	Total electricity consumption, including storage and network.
Brown et al., 2007	2007 Bottom-up	USA	Projection: Improved operation	2011	84.0	Table 3-7	Total electricity consumption, including storage and network.
Brown et al., 2007	2007 Bottom-up	USA	Projection: Best practice	2011	47.7	Table 3-7	Total electricity consumption, including storage and network.
Brown et al., 2007	2007 Bottom-up	USA	Projection: State-of-the-art	2011	33.6	Table 3-7	Total electricity consumption, including storage and network.
Koomey, 2007b	2007 Bottom-up	USA	Historical estimate	2000	23.3	Table 4	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007b	2007 Bottom-up	Global	Historical estimate	2000	58.4	Table 4	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007b	2007 Bottom-up	USA	Historical estimate	2005	45.1	Table 5	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Koomey, 2007b	2007 Bottom-up	Global	Historical estimate	2005	122.9	Table 5	Total electricity consumption (including cooling and aux equipment), excluding storage and network.
Bio Intelligence	2008 Extrapolator	EU25	Business as usual	2005	29.1	Table 59	
Bio Intelligence	2008 Extrapolator	EU26	Business as usual	2010	55.8	Table 59	
Bio Intelligence	2008 Extrapolator	EU27	Business as usual	2020	96.0	Table 59	
Bio Intelligence	2008 Extrapolator	EU28	Eco	2005	29.1	Table 60	
Bio Intelligence	2008 Extrapolator	EU29	Eco	2010	50.2	Table 60	
Bio Intelligence	2008 Extrapolator	EU30	Eco	2020	69.8	Table 60	
Koomey, 2008	2008 Bottom-up	USA	Historical estimate	2000	28.2	Table 2	Total electricity consumption, including storage and network.
Koomey, 2008	2008 Bottom-up	Global	Historical estimate	2000	70.8	Table 2	Total electricity consumption, including storage and network.
Koomey, 2008	2008 Bottom-up	USA	Historical estimate	2005	56.0	Table 2	Total electricity consumption, including storage and network.
Koomey, 2008	2008 Bottom-up	Global	Historical estimate	2005	152.5	Table 2	Total electricity consumption, including storage and network.
Pickavet et al., 2008	2008 Bottom-up	Global		2008	254.74	Fig 1	
Somavat, Jadhav & Malmodin et al., 2010	2010 Extrapolator	Global	Projection	2011	168.8	Pg 142	Takes US figure for 2011 from Brown et al., 2007 then doubles it on the assumption that US represents half the global total.
Bertoldi, 2010	2010 Bottom-up	Global	Historical estimate	2007	180	Table 2	
Bertoldi, 2010	2010 Survey	Western Europe	Survey	2007	56	Pg 2	Survey of 142 Code of Conduct participants (pg 30).
Bertoldi, 2010	2010 Survey	Western Europe	Survey	2020	104	Pg 2	
Vereecken et al., 2010a	2010 Extrapolator	Global		2008	254.74	Table III	
Vereecken et al., 2010a	2010 Extrapolator	Global		2020	992.59	Table III	
Koomey, 2011	2011 Bottom-up	Global	Upper bound	2010	271.8	Table 2	
Koomey, 2011	2011 Bottom-up	Global	Lower bound	2010	203.4	Table 2	
Koomey, 2011	2011 Bottom-up	USA	Upper bound	2010	85.6	Table 2	
Koomey, 2011	2011 Bottom-up	USA	Lower bound	2010	67.1	Table 2	
Masanet et al., 2011	2011 Bottom-up	USA	Historical estimate	2008	69.0	Table 4	
Global e-Sustainability	2012 Extrapolator	Global	Historical estimate	2011	237	Figure 5, Pg 211	Average of Koomey, 2011 & Lower Bounds.
Corcoran & Andrae,	2013 Extrapolator	Global	Koomey, 2011 Extrapolation	2010	237.4	Table 4b	Average of Koomey, 2011 & Lower Bounds. Includes network.
Corcoran & Andrae,	2013 Extrapolator	Global	Koomey, 2011 Extrapolation	2011	265.9	Table 4b	2010 figure with 12% annual growth. Includes network.
Corcoran & Andrae,	2013 Extrapolator	Global	Koomey, 2011 Extrapolation	2012	297.8	Table 4b	2010 figure with 12% annual growth. Includes network.
Corcoran & Andrae,	2013 Extrapolator	Global	2012 Baseline	2012	281	Table 4c	Data centers, excluding networks.
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2013	258	Pg 28	Data centers, excluding networks. Applied to 2010 baseline.
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2017	370	Pg 28	Data centers, excluding networks. Applied to 2010 baseline.
Corcoran & Andrae,	2013 Extrapolator	Global	Expected growth (14%)	2017	558	Pg 28	Data centers, excluding networks. Applied to 2010 baseline.
Corcoran & Andrae,	2013 Extrapolator	Global	High growth (20%)	2017	800	Pg 28	Data centers, excluding networks. Applied to 2010 baseline.
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2013	302.0	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2014	324.7	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2015	349.0	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2016	375.2	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Low growth (7.5%)	2017	403.3	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Expected growth (14%)	2013	320.3	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Expected growth (14%)	2014	365.1	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Expected growth (14%)	2015	416.2	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Expected growth (14%)	2016	474.5	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	Expected growth (14%)	2017	540.9	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	High growth (20%)	2013	337.1	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	High growth (20%)	2014	404.5	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	High growth (20%)	2015	485.5	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Corcoran & Andrae,	2013 Extrapolator	Global	High growth (20%)	2016	582.5	Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012

Corcoran & Andrae,	2013	Extrapolator Global	High growth (20%)	2017	699.1 Table 15	Data centers, excluding networks. Tracks network data growth linearly. Table incorrectly labeled as "Network Electricity Consumption". Applied to 2012
Van Heddeghem et al.,	2014	Bottom-up Global	Historical estimate	2007	216 Table 3	
Van Heddeghem et al.,	2014	Bottom-up Global	Historical estimate	2012	268 Table 3	
Liua et al., 2014	2014	Bottom-up EU27		2011	52.00 Pg 125	
Malmodin et al., 2014	2014	Top-down Sweden	Historical estimate	2010	1.38 Table S4.1	Based on Koomey, 2011, then adjusted for the global ratio between estimated active servers and PCs globally and the ratio of the number of PCs in Sweden.
Whitehead et al., 2014	2014	Extrapolator Global	Historical estimate	2010	238 Pg 154	Average of Koomey, 2011 & Lower Bounds.
Whitehead et al., 2014	2014	Extrapolator Global	Projection	2012	291 Pg 154	Extrapolates 56% growth between 2010-2015 based on same growth 2005-2010 from Koomey, 2011.
Whitehead et al., 2014	2014	Extrapolator Global	Projection	2015	371.1 Pg 154	Extrapolates 56% growth between 2010-2015 based on same growth 2005-2010 from Koomey, 2011.
Whitney & Delforge,	2014	Extrapolator USA	Historical estimate	2011	76.4 Appendix 2	
Whitney & Delforge,	2014	Extrapolator USA	Historical estimate	2013	91.0 Opening paragraph	No calculations provided.
Whitney & Delforge,	2014	Extrapolator USA	Projection	2013	140.0 Opening paragraph	No calculations provided.
Andrae & Edler, 2015	2015	Extrapolator Global	Best (15% annual improvement)	2010	189 Supplementary	Data centers, excluding networks.
Andrae & Edler, 2015	2015	Extrapolator Global	Expected (10% annual improvement)	2010	196 Supplementary	Data centers, excluding networks.
Andrae & Edler, 2015	2015	Extrapolator Global	Worst (5% annual improvement)	2010	199 Supplementary	Data centers, excluding networks.
Andrae & Edler, 2015	2015	Extrapolator Global	Best (15% annual improvement)	2020	345 Supplementary	Data centers, excluding networks. Capped at 5% annual improvement from 2022.
Andrae & Edler, 2015	2015	Extrapolator Global	Expected (10% annual improvement)	2020	660 Supplementary	Data centers, excluding networks. Capped at 5% annual improvement from 2022.
Andrae & Edler, 2015	2015	Extrapolator Global	Worst (5% annual improvement)	2020	1200 Supplementary	Data centers, excluding networks. Capped at 5% annual improvement from 2022.
Andrae & Edler, 2015	2015	Extrapolator Global	Best (15% annual improvement)	2030	1137 Supplementary	Data centers, excluding networks. Capped at 5% annual improvement from 2022.
Andrae & Edler, 2015	2015	Extrapolator Global	Expected (10% annual improvement)	2030	2967 Supplementary	Data centers, excluding networks. Capped at 5% annual improvement from 2022.
Andrae & Edler, 2015	2015	Extrapolator Global	Worst (5% annual improvement)	2030	7993 Supplementary	Data centers, excluding networks. Capped at 5% annual improvement from 2022.
Bio by Deloitte, 2015	2015	Bottom-up EU28		2015	78 Pg 32 (Task 7)	
Hintemann, 2015a	2015	Bottom-up Germany		2010	10.5 Figure 1	Update to Stobbe et al., 2015 (in German so excluded).
Hintemann, 2015a	2015	Bottom-up Germany		2015	12.0 Figure 1	Update to Stobbe et al., 2015 (in German so excluded).
Hintemann, 2015a	2015	Bottom-up Germany		2020	14.3 Figure 1	Update to Stobbe et al., 2015 (in German so excluded).
Hintemann, 2015a	2015	Bottom-up Germany		2025	16.4 Figure 1	Update to Stobbe et al., 2015 (in German so excluded).
Hintemann, 2015b	2015	Bottom-up Germany		2008	10.1 Figure 3	Update to Hintemann and Fichter, 2010 (in German so excluded).
Hintemann, 2015b	2015	Bottom-up Germany		2013	9.7 Figure 3	Update to Hintemann and Fichter, 2010 (in German so excluded).
Hintemann & Clausen,	2016	Bottom-up Germany		2010	10.4 Table II	Figure taken from Stobbe et al., 2015 (in German so excluded).
Hintemann & Clausen,	2016	Bottom-up Germany		2015	11.7 Table II	Figure taken from Stobbe et al., 2015 (in German so excluded).
Hintemann & Clausen,	2016	Bottom-up Global		2010	222.8 Table II	
Hintemann & Clausen,	2016	Bottom-up Global		2015	287 Table II	
Shehabi et al., 2016	2016	Bottom-up USA		2014	70 Executive Summary	
Shehabi et al., 2016	2016	Bottom-up USA		2020	73 Executive Summary	
Malmodin & Lundén,	2016	Unknown Sweden		2015	1.25 Pg 212	Based on Malmodin et al., 2014 but calculations for this updated figure are not provided.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2013	98.99 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2014	98.11 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2015	106.00 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2016	105.41 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2017	112.13 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2018	108.62 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2019	95.48 Table 1	System boundary unknown. Converted from GW to TWh.
Bertoldi, Avgerinou & Ca	2017	Unknown Europe		2020	99.26 Table 1	System boundary unknown. Converted from GW to TWh.
Avgerinou, Bertoldi & Castellazzi, 2017	2017	Survey Europe		2016	3.7 Pg 154	289 data centers from 120 organizations. The previous report - Bertoldi, 2014 - states that this covers 3-5% of the total data centers in Europe.
IEA, 2017	2017	Bottom-up Global		2014	194 Pg 105	
IEA, 2017	2017	Bottom-up Global		2020	200 Pg 106	
Malmodin & Lundén, 2018	2018	Bottom-up Global		2015	245 Table 6	
Shehabi et al., 2018	2018	Bottom-up USA	Projection: Best practices	2020	45 Pg 8	
Shehabi et al., 2018	2018	Bottom-up USA	Projection: Current trends	2020	73 Pg 7	
Shehabi et al., 2018	2018	Bottom-up USA	Projection: Frozen efficiency	2020	170 Pg 8	
Belkhir & Elmeligi, 2018	2018	Extrapolator Global		2008	254 Pg 456	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2010	10.5 Figure 1	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2011	10.7 Figure 1	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2012	10.9 Figure 1	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2013	11.2 Figure 1	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2014	11.5 Figure 1	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2015	12.0 Figure 1	
Hintemann & Hinterholzer, 2019	2019	Bottom-up Germany		2016	12.4 Figure 1	

Hintemann & Hinterholzer, 2019	2019 Bottom-up	Germany	2017	13.2	Figure 1	
Hintemann & Hinterholzer, 2019	2019 Bottom-up	Global	2017	350	Figure 4	
Greenpeace & North China Electric Power University, 2019	2019 Unknown	China	2018	160.89	Pg 4	Detailed report in Chinese. Summary provided in English.
Greenpeace & North China Electric Power University, 2019	2019 Unknown	China	2019	178.02	Pg 4	Detailed report in Chinese. Summary provided in English.
Greenpeace & North China Electric Power University, 2019	2019 Unknown	China	2020	196.96	Pg 4	Detailed report in Chinese. Summary provided in English.
Greenpeace & North China Electric Power University, 2019	2019 Unknown	China	2021	217.93	Pg 4	Detailed report in Chinese. Summary provided in English.
Greenpeace & North China Electric Power University, 2019	2019 Unknown	China	2022	241.13	Pg 4	Detailed report in Chinese. Summary provided in English.
Greenpeace & North China Electric Power University, 2019	2019 Unknown	China	2023	266.79	Pg 4	Detailed report in Chinese. Summary provided in English.
Andrae, 2019a	2019 Extrapolator	Global	2018	211	Table 1	
Andrae, 2019a	2019 Extrapolator	Global	2019	208	Table 1	
Andrae, 2019a	2019 Extrapolator	Global	2020	207	Table 1	
Andrae, 2019a	2019 Extrapolator	Global	2021	202	Table 1	
Andrae, 2019a	2019 Extrapolator	Global	2022	239	Table 1	
Andrae, 2019a	2019 Extrapolator	Global	2023	287		
Andrae, 2019a	2019 Extrapolator	Global	2024	347		
Andrae, 2019a	2019 Extrapolator	Global	2025	429		
Andrae, 2019a	2019 Extrapolator	Global	2026	540		
Andrae, 2019a	2019 Extrapolator	Global	2027	702		
Andrae, 2019a	2019 Extrapolator	Global	2028	946		
Andrae, 2019a	2019 Extrapolator	Global	2029	1324		
Andrae, 2019a	2019 Extrapolator	Global	2030	1929		
Andrae, 2019b	2019 Bottom-up	Global	2010	189		
Andrae, 2019c	2019 Extrapolator	Global	2030	8253	Table IV	
Andrae, 2019d	2019 Extrapolator	Global	2010	196	Table 2	
		Data centers, data traffic 33.8%, EI -12.4%				
Andrae, 2019d	2019 Extrapolator	Global	2015	220	Table 2	
		Data centers, data traffic 33.8%, EI -12.4%				
Andrae, 2019d	2019 Extrapolator	Global	2020	207	Table 2	
		Data centers, data traffic 33.8%, EI -12.4%				
Andrae, 2019d	2019 Extrapolator	Global	2025	249	Table 3	
		Data centers, data traffic 33.8%, EI -12.4%				
Andrae, 2019d	2019 Extrapolator	Global	2030	944	Table 3	
		Data centers, data traffic 33.8%, EI -12.4%				
Andrae, 2019d	2019 Extrapolator	Global	2010	196	Table 2	
		Data centers, server 1.4%, EI -1.77%				
Andrae, 2019d	2019 Extrapolator	Global	2015	220	Table 2	
		Data centers, server 1.4%, EI -1.77%				
Andrae, 2019d	2019 Extrapolator	Global	2020	207	Table 2	
		Data centers, server 1.4%, EI -1.77%				
Andrae, 2019d	2019 Extrapolator	Global	2025	205	Table 3	
		Data centers, server 1.4%, EI -1.77%				
Andrae, 2019d	2019 Extrapolator	Global	2030	198	Table 3	
		Data centers, data traffic 56%, EI -22%				
Andrae, 2019d	2019 Extrapolator	Global	2010	196	Table 2	
		Data centers, data traffic 56%, EI -22%				
Andrae, 2019d	2019 Extrapolator	Global	2015	220	Table 2	
		Data centers, data traffic 56%, EI -22%				
Andrae, 2019d	2019 Extrapolator	Global	2020	207	Table 2	
		Data centers, data traffic 56%, EI -22%				
Andrae, 2019d	2019 Extrapolator	Global	2025	556	Table 3	
		Data centers, data traffic 56%, EI -22%				
Andrae, 2019d	2019 Extrapolator	Global	2030	1495	Table 3	
		Data centers, data traffic 56%, EI -22%				
Andrae, 2019d	2019 Extrapolator	Global	2010	273	Table 2	
		Data centers, data traffic 25%, EI -24%				
Andrae, 2019d	2019 Extrapolator	Global	2015	245	Table 2	
		Data centers, data traffic 25%, EI -24%				
Andrae, 2019d	2019 Extrapolator	Global	2020	231	Table 2	
		Data centers, data traffic 25%, EI -24%				
Andrae, 2019d	2019 Extrapolator	Global	2025	184	Table 3	
		Data centers, data traffic 25%, EI -24%				
Andrae, 2019d	2019 Extrapolator	Global	2030	146	Table 3	
		Data centers, data traffic 25%, EI -24%				
Andrae, 2019d	2019 Extrapolator	Global	2010	196	Table 2	
		Data centers, data traffic 25%, EI -22%				

Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -22%	2015	220 Table 2	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -22%	2020	207 Table 2	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -22%	2025	183 Table 3	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -22%	2030	163 Table 3	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -14%	2010	227 Table 2	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -14%	2015	400 Table 2	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -14%	2020	651 Table 2	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -14%	2025	952 Table 3	
Andrae, 2019d	2019 Extrapolator Global	Data centers, data traffic 25%, EI -14%	2030	1393 Table 3	
Andrae, 2019d	2019 Extrapolator Global	4.4% Historical Compound Aggregated Growth Rate (CAGR) of electricity TWh - > TWh	2025	256 Table 4	
Andrae, 2019d	2019 Extrapolator Global	4.4% Historical Compound Aggregated Growth Rate (CAGR) of electricity TWh - > TWh	2030	318 Table 4	
Andrae, 2019d	2019 Extrapolator Global	Updates to previous models	2020	299 Table 9	Input parameters not provided.
Andrae, 2019d	2019 Extrapolator Global	Updates to previous models	2025	412 Table 9	Input parameters not provided.
Andrae, 2019d	2019 Extrapolator Global	Updates to previous models	2030	974 Table 9	Input parameters not provided.
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2013	323 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2014	322 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2015	400 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2016	498 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2017	593 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2020	894 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2023	1242 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Expected Updated	2025	1918 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2013	323 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2014	322 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2015	400 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2016	503 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2017	559 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2020	651 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2023	802 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth higher energy efficiency	2025	1236 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2013	323 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2014	322 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2015	400 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2016	503 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2017	559 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2020	651 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2023	1014 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Higher growth peaked energy efficiency	2025	2040 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2013	323 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2014	322 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2015	400 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2016	503 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2017	559 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2020	651 Appendix 1	
The Shift Project, 2019	2019 Extrapolator Global	Sobriety	2023	753 Appendix 1	

The Shift Project, 2019	2019	Extrapolator	Global	Sobriety	2025	761	Appendix 1
Hintemann, 2020	2020	Bottom-up	Germany		2010	10.5	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2011	10.7	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2012	10.9	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2013	11.2	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2014	11.5	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2015	12.0	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2016	12.4	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2017	13.2	Figure 1
Hintemann, 2020	2020	Bottom-up	Germany		2018	14.0	Figure 1
Hintemann, 2020	2020	Bottom-up	Global		2018	400.0	Pg 4
Andrae, 2020a	2020	Unknown	Global		2020	289.87	Section 5.1
Andrae, 2020a	2020	Unknown	Global		2018	400	Section 5.1
Andrae, 2020a	2020	Unknown	Global		2030	2000	Section 5.1
Andrae, 2020a	2020	Unknown	Global		2020	294	Section 5.1
Andrae, 2020a	2020	Unknown	Global		2030	783	Section 5.1
Andrae, 2020a	2020	Unknown	Global		2015	220	Table 7
Andrae, 2020a	2020	Unknown	Global		2020	207	Table 7
Andrae, 2020a	2020	Unknown	Global		2025	469	Table 7
Andrae, 2020a	2020	Unknown	Global		2030	799	Table 7
Andrae, 2020b	2020	Extrapolator	Global		2020	299	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2021	311	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2022	328	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2023	320	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2024	377	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2025	412	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2026	471	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2027	551	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2028	652	Table 1
Andrae, 2020b	2020	Extrapolator	Global		2029	788	Table 1
Andrae, 2020b	2020	Extrapolator	Global	Data Centers Expected	2020	299	Figure 1
Andrae, 2020b	2020	Extrapolator	Global	Data Centers Best	2020	196	Figure 1
Andrae, 2020b	2020	Extrapolator	Global	Data Centers Expected	2030	974	Figure 1
Andrae, 2020b	2020	Extrapolator	Global	Data Centers Best	2030	366	Figure 1
Masanet et al., 2020	2020	Bottom-up	Global	Historical	2010	193.7	Supplementary Material: Sheet "Figure 2a"
Masanet et al., 2020	2020	Bottom-up	Global	Historical	2018	205.2	Supplementary Material: Sheet "Figure 2a"
Masanet et al., 2020	2020	Bottom-up	Global	Current trends analysis	2019	199.3	Supplementary Material: Sheet "Figure 2a"
Masanet et al., 2020	2020	Bottom-up	Global	Current trends analysis	2020	196.2	Supplementary Material: Sheet "Figure 2a"
Masanet et al., 2020	2020	Bottom-up	Global	Current trends analysis	2021	195.0	Supplementary Material: Sheet "Figure 2a"
Masanet et al., 2020	2020	Bottom-up	Global	Current trends analysis	2022	201.3	Supplementary Material: Sheet "Figure 2a"
Masanet et al., 2020	2020	Bottom-up	Global	Current trends analysis	2023	209.6	Supplementary Material: Sheet "Figure 2a"
Montevecchi et al., 2020	2020	Bottom-up	EU28		2010	53.9	Pg 52
Montevecchi et al., 2020	2020	Bottom-up	EU28		2018	76.8	Pg 52
Montevecchi et al., 2020	2020	Bottom-up	EU28		2025	92.6	Pg 52
Liu et al., 2020	2020	Extrapolator	Global	Decentralized	2030	1800	Pg 278
Liu et al., 2020	2020	Extrapolator	Global	Centralized	2030	1499	Fig 10
Koot & Wijnhoven, 2021	2021	Bottom-up	Global	Baseline	2016	286.42	Table 8
Koot & Wijnhoven, 2021	2021	Bottom-up	Global	Baseline	2030	320.87	Table 8
Koot & Wijnhoven, 2021	2021	Bottom-up	Global	End of Moore's Law	2030	658.03	Table 8
Koot & Wijnhoven, 2021	2021	Bottom-up	Global	Rise of Industrial IoT	2030	364.00	Table 8
Koot & Wijnhoven, 2021	2021	Bottom-up	Global	End of Moore's Law + Rise of Industrial IoT	2030	752.00	Pg 11

# Quick Guide to this Database

This Excel workbook contains data sheets that map all assessed publications (46) to (676 ungrouped mappings) and within the respective data center data categories (published manuscript for a full explanation of how data sources were treated and context before diving into the data here. We have tried to make the data found as possible, with as much removal of subjectivity in our analysis. The main sheet is 'Cit find the ungrouped and individual publication-to-source mappings as described in The following information below will help you to understand the main columns in the acronyms used for data source organisations. All cells have been protected to formulae used.

## Understanding the data

This supplementary workbook that accompanies our paper is fairly simple in its layout data that has been used to derive our findings. We suggest beginning with the "Cit each assessed publication, extracts the main data as per the categories below. The Mapping - Grouped" sheet is that we have grouped the main sources of data when maintaining their publication mapping. The "Lookups" and "Citation Count" sheets transparency in the values and categories used in our assessment, and the "Stats" key descriptive statistics that help to frame the explored mappings. This workbook our paper to best understand the data demonstrated.

## Glossary of Terms

### Main Data Columns

Authors

Authors of the 46 publications assessed

Year	Year of publication
Source	Data source being used by 'Authors'
Source (Grouped for Visualisations)	Sources grouped by organisation where a
Source (Pre-Group)	Ungrouped sources in grouped sheet. Sar
Source Type	Type of data publication/access
Source Year	Year associated with the data source as ci
Source Use	Data center data categories being used by
Source Reliability	Access categorization as outlined in 'Sour
Citation Count	Total citations taken from Google Scholar
Source Use (Grouped)	Use grouped by source
Unique Sources	Full list of unique sources used within our
Unique Sources (Reliability)	Most appropriate 'Source Reliability' for e
Unique Sources (Type)	Most appropriate 'Source Type' for each u
Times cited	Number of times a unique sources has be
Source Year (no blanks)	List of 'Source Year' with blanks removed

### Source Reliability Categories

EL	Existing Link
NF	Not Found
BL	Broken Link
NS	No Source (methods/source)
PC	Private/Commerical

### Data Center Source Categories

MS	Market sources
SS	Server sources
StS	Storage sources
NtS	Network sources
IS	Infrastructure sources

### Organisations (Data Sources)

IDC	International Data Corporation
GeIS	Global Enabling Sustainability Initiative
BCG	Boston Consulting Group
CEET	Centre for Energy Efficient Telecommunic
SPEC	Standard Performance Evaluation Corpora
SNIA	Storage Networking Industry Association

PTS	The Swedish Post and Telecom Agency
DCD	DatacenterDynamics
AC4DC	Adaptive Computing For Data Centers
CBRE	Coldwell Banker Richard Ellis
NCEPU	North China Electric Power University
CB	Statistics Sweden
CESI	China Electronics Standardization Institute
FIRI	Forward Industry Research Institute
NL Times	Netherlands Times
NRDC	Natural Resources Defence Council
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers



to their respective data sources  
(e.g., 'MS', 'SS' etc.). Please see our  
analysis to provide sufficient  
information as clear and transparent as  
'Citation Mapping' where you can  
see our publication's analysis sections.  
the 'raw' data, as well as some of  
prevent accidental breakage of

output and is to be read as the 'raw'  
'Citation Mapping' sheet, which for  
the main difference with the "Citation  
is appropriate to do so while  
are simply included for  
the sheet brings the data together in  
it must be used in conjunction with

as of February, 2022 (see publication for further information)



Authors	Year
Brown et al., 2007	2007
Brown et al., 2007	2007
Brown et al., 2007	2007
Brown et al., 2007	2007
Brown et al., 2007	2007
Brown et al., 2007	2007
Koomey, 2007a	2007
Koomey, 2007a	2007
Koomey, 2007a	2007
Koomey, 2007a	2007
Koomey, 2007a	2007
Koomey, 2007b	2007
Koomey, 2007b	2007
Koomey, 2007b	2007
Koomey, 2007b	2007
Bio Intelligence Service, 2008	2008
Bio Intelligence Service, 2008	2008
Bio Intelligence Service, 2008	2008
Bio Intelligence Service, 2008	2008
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Koomey, 2008	2008
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Pickavet et al., 2008	2008
Pickavet et al., 2008	2008

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Pickavet et al., 2008	2008
Bertoldi, 2010	2010
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Bertoldi, 2010	2010
Corcoran & Andrae, 2013	2010
Corcoran & Andrae, 2013	2010
Corcoran & Andrae, 2013	2010
Corcoran & Andrae, 2013	2010
Corcoran & Andrae, 2013	2010
Malmodin et al., 2010	2010
Malmodin et al., 2010	2010
Malmodin et al., 2010	2010
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Malmodin et al., 2014	2010
Somavat, Jadhav & Namboodiri, 2010	2010
Somavat, Jadhav & Namboodiri, 2010	2010
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Somavat, Jadhav & Namboodiri, 2010	2010
Somavat, Jadhav & Namboodiri, 2010	2010
Vereecken et al., 2010a	2010

Vereecken et al., 2010a	2010
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Vereecken et al., 2010a	2010
Koomey, 2011	2011
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Masanet et al., 2011	2011
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Corcoran & Andrae, 2013	2013
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Liua et al., 2014	2014
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Liua et al., 2014	2014

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Malmodin & Lunden, 2018a	2018
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Shehabi et al., 2018	2018
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Andrae, 2019a	2019
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Andrae, 2020a	2020
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Andrae, 2020a	2020
Andrae, 2020a	2020
Andrae, 2020a	2020
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Liu et al., 2020	2020
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Liu et al., 2020	2020
Masanet et al., 2020	2020
Masanet et al., 2020	2020
Masanet et al., 2020	2020
Masanet et al., 2020	2020

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Source	Source Type
Expert Interviews	Personal Communications
Expert Interviews	Personal Communications
IDC	Data with source
Koomey, 2007a	Report
Koomey, 2007a	Report
US EPA	Report (Draft)
Cohen et al., 2007 (IDC)	Report (Draft)
Cohen et al., 2007 (IDC)	Data with source
Greenberg et al., 2006	Report
Malone & Belady, 2006	Paper (Conference)
Manufacturing Data	Data without source
IDC	Personal Communications
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Bailey et al., 2007 (IDC)	Report
Belady & Malone, 2007	Paper (Conference)
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Greenberg et al., 2006	Report
IDC	Data with source
Koomey, 2007a	Report
Koomey, 2007b	Report
Koomey, 2007a	Report
Koomey, 2007a	Report

Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Survey	Primary Data Collection (Survey)
Survey	Primary Data Collection (Survey)
Survey	Primary Data Collection (Survey)
Survey	Primary Data Collection (Survey)
Survey	Primary Data Collection (Survey)
Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
IDC	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007b	Report
Koomey, 2007b	Report
Koomey, 2007b	Report
Koomey, 2007b	Report
Donovan, 2009	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
PTS	Data with source
TeliaSonera, 2008	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Gartner, 2007	Report
Koomey, 2007a	Report
Pickavet et al., 2008	Paper (Conference)

Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Pickavet et al., 2008	Paper (Conference)
Bailey et al., 2007 (IDC)	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
IDC	Personal Communications
Koomey, 2008	Paper (Journal)
Koomey, 2008	Paper (Journal)
Koomey, 2008	Paper (Journal)
Koomey, 2008	Paper (Journal)
Koomey, 2008	Paper (Journal)
Advanced Micro Devices	Data with source
Bailey et al., 2007 (IDC)	Report
Battles et al., 2007	Report
Belady et al., 2008	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Brown et al., 2008	Report
Energy Star, 2009	Specification Document
Greenberg et al., 2006	Report
IDC	Data with source
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007a	Report
Koomey, 2007b	Paper (Journal)
Koomey, 2007b	Report
Koomey, 2007b	Report
Koomey, 2008	Paper (Journal)
Koomey, 2008	Paper (Journal)
Personal Communication	Personal Communications
Personal Communication	Personal Communications
Personal Communication	Personal Communications
ATandT	Data without source

ATandT	Data without source
BCG	Data without source
BCG	Data without source
Carbon Disclosure Project, 2011	Report
Cisco	Data without source
Cisco	Data without source
Expert Interviews	Data without source
Google	Data without source
Koomey 2011	Report
Koomey 2011	Report
Koomey 2011	Report
Koomey 2011	Report
Koomey 2011	Report
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
CEET, 2013	Report
Cisco	Data with source
Corcoran, 2012	Paper (Magazine)
Corcoran, 2012	Paper (Magazine)
Corcoran, 2012	Paper (Magazine)
Corcoran, 2012	Paper (Magazine)
Corcoran, 2012	Paper (Magazine)
Coroama et al., 2013	Paper (Journal)
Cucchietti et al., 2007	Paper (Conference)
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Lambert et al., 2012	Paper (Journal)
Telecom Italia	Data with source
Telecom Italia, 2012	Report
Verizon Communications, 2010	Report
Arnclan Computer Services, 2011	Report
Bozman & Broderick, 2010	Report
Expert Interviews	Data without source
IDC	Data without source
Kaskade, 2011	Blog Post



Koomey, 2011	Report
NetApp, 2009	Report
Schappi et al., 2009	Report
Schappi et al., 2009	Report
SNIA, 2011	Report
SPEC	Data with source
Stansberry & Kudritzki, 2012	Report
Stansberry & Kudritzki, 2012	Report
Energy Star, 2010	Specification Document
IDC, 2012	Data without source
IDC, 2013	Data without source
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Uptime institute, 2011	Report
DCD, 2011	Report
DCD, 2012	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Masanet et al., 2011	Paper (Journal)
Bennett & Delforge, 2012	Report
Brown et al., 2007	Report
Expert Interviews	Data without source
GeSI & BCG, 2012	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Lorenz, 2011	Blog Post
Masanet et al., 2011	Paper (Journal)
Masanet et al., 2011	Paper (Journal)
Masanet et al., 2011	Paper (Journal)
Masanet et al., 2011	Paper (Journal)
Masanet et al., 2011	Paper (Journal)
SPEC	Data with source

Cisco, 2013	Report
Corcoran & Andrae, 2013	Report
Corcoran & Andrae, 2013	Report
Corcoran & Andrae, 2013	Report
Hachman, 2015	News Piece
Hachman, 2015	News Piece
Hachman, 2015	News Piece
Time Magazine, 2012	News Piece
Time Magazine, 2012	News Piece
Time Magazine, 2012	News Piece
Tucker et al., 2012	Paper (Conference)
Tucker et al., 2012	Paper (Conference)
Tucker et al., 2012	Paper (Conference)
Cisco, 2013	Data with source
DIGITALEUROP	Data with source
DIGITALEUROP	Data with source
Enterprise Storage Forum	Blog Post
Fujitsu	Data with source
Gartner	Data without source
Gartner, 2012	Report
Gartner, 2013	Report
Gartner, 2014	Report
Google	Data with source
HGST	Data without source
HP	Data with source
IDC	Data without source
IDC, 2010	Report
IDC, 2014	Report
PRODCOM, 2012	Data with source
Seagate	Data with source
SPEC	Data with source
The Green Grid, 2009	Report
Uptime Institute, 2014	Report
AC4DC	Data without source
AC4DC	Data without source
AC4DC	Data without source
AC4DC	Data without source
AC4DC	Data without source
Hintemann et al., 2014	Primary Data Collection (Survey)
Hintemann et al., 2014	Primary Data Collection (Survey)

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Hintemann et al., 2014	Primary Data Collection (Survey)
Hintemann et al., 2014	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
IDC/EITO	Data without source
Techconsult	Data without source
DCD, 2013a	Report
DCD, 2013b	Report
Experton, 2011	Report
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Hintemann, 2015b	Primary Data Collection (Survey)
Howard-Healy, 2013	Report
Techconsult	Data without source
Cisco, 2015	Report
Gartner	Data without source
IDC	Data without source
IHS	Data without source
Lunden & Malmodin, 2013	Paper (Conference)
Lunden & Malmodin, 2013	Paper (Conference)
Lunden & Malmodin, 2013	Paper (Conference)
Lunden & Malmodin, 2013	Paper (Conference)
Lunden & Malmodin, 2013	Paper (Conference)
Malmodin et al., 2014	Paper (Journal)
Malmodin et al., 2014	Paper (Journal)
Malmodin et al., 2014	Paper (Journal)
Malmodin et al., 2014	Paper (Journal)
Malmodin et al., 2014	Paper (Journal)
PTS, 2015	Data with source
SCB, 2015	Data without source
Swedish Energy Agency, 2009	Data with source
Swedish Energy Agency, 2009	Data with source
Swedish Energy Agency, 2009	Data with source
Swedish Energy Agency, 2009	Data with source

[illegible]

BroadGroup, 2014	Data without source
BroadGroup, 2014	Data without source
Cisco, 2016	Data with source
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Technavio, 2014	Data with source
Technavio, 2015	Data with source
Vereecken et al., 2010b	Paper (Journal)
Vereecken et al., 2010b	Paper (Journal)
Vereecken et al., 2010b	Paper (Journal)
Vereecken et al., 2010b	Paper (Journal)
Fuchs et al., 2017	Report
IDC	Data with source
IEA, 2017	Report
IEA, 2017	Report
IEA, 2017	Report
IEA, 2017	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Koomey, 2011	Report
Malmodin & Lunden, 2016	Paper (Conference)
Malmodin & Lunden, 2016	Paper (Conference)
Malmodin & Lunden, 2016	Paper (Conference)
Malmodin & Lunden, 2016	Paper (Conference)
Malmodin & Lunden, 2016	Paper (Conference)
Malmodin & Lunden, 2018b	Report
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2010	Paper (Journal)
Malmodin et al., 2013	Paper (Conference)
Malmodin et al., 2013	Paper (Conference)
Malmodin et al., 2013	Paper (Conference)
Malmodin et al., 2013	Paper (Conference)
Malmodin et al., 2013	Paper (Conference)
Shehabi et al., 2016	Report

Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
ASHRAE, 2015	Report
Brown et al., 2007	Report
Brown et al., 2007	Report
Chen et al., 2015	Paper (Journal)
Dietrich, 2014	Presentation
IDC	Data with source
IDC	Personal Communications
IDC, 2015	Data with source
Lanzisera et al., 2012	Paper (Journal)
Masanet et al., 2011	Paper (Conference)
Reinsel, 2010	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
SPEC	Data with source
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Ericsson, 2018	Report
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Bashroush, 2018	Paper (Journal)
Hilbert & Lopez, 2011	Paper (Journal)
Ionescu, 2017	Paper (Conference)
Summers, 2018	Presentation
Van Heddeghem et al., 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)

Andrae, 2019b	Report (Self-Published)
Andrae, 2019b	Report (Self-Published)
Bennett, 1982	Paper (Journal)
Frank, 2005	Paper (Conference)
Hoefflinger, 2016	Book Chapter
Landauer, 1988	Paper (Journal)
Porod, 2019	Book Chapter
Summers, 2017	Presentation
Summers, 2018	Presentation
Van Heddeghem et al., 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)
Cisco, 2018	Data with source
Gartner, 2020	News Piece
Malmodin & Lunden, 2018a	Paper (Journal)
Malmodin & Lunden, 2018a	Paper (Journal)
Malmodin & Lunden, 2018a	Paper (Journal)
Malmodin & Lunden, 2018a	Paper (Journal)
Shi et al., 2019	Paper (Conference)
The Shift Project, 2019	Report
The Shift Project, 2019	Report
The Shift Project, 2019	Report
The Shift Project, 2019	Report
Van Heddeghem et al., 2014	Paper (Journal)
Van Heddeghem et al., 2014	Paper (Journal)
Van Heddeghem et al., 2014	Paper (Journal)
Van Heddeghem et al., 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
Xu, 2014	Paper (Journal)
CESI, 2019	Report
China Cooling Association, 2016	Report

China Cooling Association, 2016	Report
China Cooling Association, 2016	Report
China Cooling Association, 2016	Report
China Cooling Association, 2016	Report
FIRI, 2019	Report
Kezhi Consulting, 2019	Report
Synergy Research Group, 2019	Report
CBRE, 2017	Report
CBRE, 2018	Report
Cisco, 2015	Data with source
Cisco, 2016	Data with source
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Hintemann & Clausen, 2016	Paper (Conference)
Hintemann & Clausen, 2016	Paper (Conference)
Hintemann & Clausen, 2016	Paper (Conference)
Hintemann & Clausen, 2016	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann et al., 2016	Paper (Conference)
Hintemann et al., 2016	Paper (Conference)
Hintemann et al., 2016	Paper (Conference)
Hintemann et al., 2016	Paper (Conference)
Hintemann, 2015	Paper (Journal)
Hintemann, 2015	Paper (Journal)
Hintemann, 2015	Paper (Journal)
Hintemann, 2015	Paper (Journal)
Hintemann, 2015	Paper (Journal)
Howard-Healy, 2018	Presentation
IDC, 2018	Data with source
IDC/EITO	Data without source
Techconsult	Data without source
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)



Andrae & Edler, 2015	Paper (Journal)
Cisco, 2015	Data with source
Cisco, 2016	Data with source
Cisco, 2016a	Report
Cisco, 2018	Data with source
Expert Interviews	Personal Communications
Gartner	Data without source
IDC	Data without source
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Statista	Data without source
The Zettabyte Era, 2017	Report
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae, 2019c	Paper (Journal)
Andrae, 2019c	Paper (Journal)
Andrae, 2019c	Paper (Journal)
Andrae, 2019c	Paper (Journal)
Andrae, 2019d	Paper (Journal)
Andrae, 2019d	Paper (Journal)
Andrae, 2019d	Paper (Journal)
Andrae, 2019d	Paper (Journal)
Andrae, 2019d	Paper (Journal)
Andrae, 2019d	Paper (Journal)
Greenpeace & NCEPU, 2019	Report
Mitchell & York, 2020	Paper (Journal)
Stobbe et al., 2021	Book Chapter
Zhang et al., 2020	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae, 2020a	Paper (Journal)
Andrae, 2020a	Paper (Journal)
CBRE, 2017	Report
CBRE, 2018	Report
CBRE, 2020	Report
Cisco, 2015	Data with source
Cisco, 2016	Data with source

Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Gartner, 2020	Data with source
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann, 2015	Paper (Journal)
Howard-Healy, 2018	Report
IDC, 2018	Data with source
IDC/EITO	Data without source
Techconsult	Data without source
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Avgerinou, Bertoldi & Castellazzi, 201	Paper (Journal)
Cisco, 2013	Data with source
Cisco, 2016b	Data with source
Corcoran & Andrae, 2013	Report
Corcoran & Andrae, 2013	Report
Corcoran & Andrae, 2013	Report
Corcoran & Andrae, 2013	Report
Dagher, Marcellin & Neifeld, 2007	Paper (Journal)
Dagher, Marcellin & Neifeld, 2007	Paper (Journal)
Dagher, Marcellin & Neifeld, 2007	Paper (Journal)
Dagher, Marcellin & Neifeld, 2007	Paper (Journal)
Hachman, 2015	News Piece
Hachman, 2015	News Piece
Hachman, 2015	News Piece
Hachman, 2015	News Piece
Avgerinou, Bertoldi & Castellazzi, 201	Paper (Journal)
Cisco, 2011	Report
Cisco, 2012	Report
Cisco, 2013	Report

Cisco, 2014	Report
Cisco, 2015	Report
Cisco, 2016	Report
Cisco, 2016	Report
Cisco, 2016	Report
Cisco, 2018	Report
Cisco, 2018	Report
Cisco, 2018	Report
Daly et al., 2020	Paper (Magazine)
Fuchs et al., 2020	Paper (Journal)
Google, 2019	Report
Kief & Victora, 2018	Paper (Journal)
Koomey, 2008	Paper (Journal)
Reinsel et al., 2018 (IDC)	Report
Reinsel et al., 2018 (IDC)	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Synergy Research Group, 2019	Data with source
Synergy Research Group, 2019	Data with source
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae & Edler, 2015	Paper (Journal)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019a	Report (Self-Published)
Andrae, 2019e	Presentation
Andrae, 2019e	Presentation
Andrae, 2019e	Presentation
Andrae, 2019e	Presentation
Avgerinou, Bertoldi & Castellazzi, 201	Paper (Journal)
Avgerinou, Bertoldi & Castellazzi, 201	Paper (Journal)
Avgerinou, Bertoldi & Castellazzi, 201	Paper (Journal)
Avgerinou, Bertoldi & Castellazzi, 201	Paper (Journal)
Bio by Deloitte, 2015	Report
Bio by Deloitte, 2015	Report

Bio by Deloitte, 2015	Report
Bio by Deloitte, 2015	Report
CBRE, 2017	Report
CBRE, 2018	Report
Cisco, 2015	Report
Cisco, 2016	Report
Digiconomist, 2019	Report
Digiconomist, 2019	Report
Digiconomist, 2019	Report
Digiconomist, 2019	Report
Expert Interviews	Personal Communications
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Fichter & Hintemann, 2014	Paper (Journal)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann & Hinterholzer, 2019	Paper (Conference)
Hintemann et al., 2014	Paper (Conference)
Hintemann, 2015	Paper (Journal)
Howard-Healy, 2018	Report
IDC/EITO	Data without source
IEA, 2019	Data with source
IEA, 2019	Data with source
IEA, 2019	Data with source
IEA, 2019	Data with source
Koomey & Taylor, 2015	Report
Koomey & Taylor, 2015	Report
Koomey & Taylor, 2015	Report
Koomey & Taylor, 2015	Report
Malmodin & Lunden, 2018a	Paper (Journal)
Manufacturing Data	Data without source
Manufacturing Data	Data without source
Manufacturing Data	Data without source
Manufacturing Data	Data without source
Masanet et al., 2020	Paper (Journal)
Rauchs et al., 2019	Report

Rauchs et al., 2019	Report
Rauchs et al., 2019	Report
Rauchs et al., 2019	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2018	Paper (Journal)
Shehabi et al., 2018	Paper (Journal)
Shehabi et al., 2018	Paper (Journal)
Shehabi et al., 2018	Paper (Journal)
Techconsult	Data without source
The Shift Project, 2019	Report
The Shift Project, 2019	Report
The Shift Project, 2019	Report
The Shift Project, 2019	Report
Van Heddeghem et al., 2014	Paper (Journal)
Van Heddeghem et al., 2014	Paper (Journal)
Van Heddeghem et al., 2014	Paper (Journal)
Van Heddeghem et al., 2014	Paper (Journal)
Aslan et al., 2018	Paper (Journal)
Barroso et al., 2013	Report
Cisco, 2013	Data with source
Cisco, 2013	Data with source
Cisco, 2013	Data with source
Cisco, 2013	Data with source
Cisco, 2020	Report
Kuckelhaus et al., 2015	Report
Masanet et al., 2020	Paper (Journal)
Masanet et al., 2020	Paper (Journal)
Masanet et al., 2020	Paper (Journal)
Masanet et al., 2020	Paper (Journal)
NL Times, 2018	Report
Shalf, 2020	Paper (Journal)
Shehabi et al., 2016	Report
Shehabi et al., 2016	Report
Shehabi et al., 2018	Paper (Journal)
Shehabi et al., 2018	Paper (Journal)
Shehabi et al., 2018	Paper (Journal)

Source Year	Source Use	Source Reliability
	SS	PC
	NtS	PC
	MS	PC
2007	SS	EL
2007	IS	EL
	IS	NF
2007	MS	PC
	MS	PC
2006	IS	EL
2006	IS	EL
	SS	NS
	IS	PC
2007	MS	EL
2007	SS	EL
2007	IS	EL
2007	MS	EL
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2007	MS	EL
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2007	MS	PC
2007	IS	EL
2007	MS	EL
2007	StS	EL
2007	NtS	EL
2006	IS	EL
	MS	PC
2007	SS	EL
2007	SS	EL
2007	MS	EL
2007	SS	EL

2007	StS	EL
2007	NtS	EL
2007	IS	EL
	MS	NS
	SS	NS
	StS	NS
	NtS	NS
	IS	NS
2008	MS	EL
2008	SS	EL
2008	StS	EL
2008	NtS	EL
2008	IS	EL
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2006	MS	PC
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2009	NtS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
	MS	BL
2008	MS	NS
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2007	MS	BL
2007	MS	EL
2008	MS	EL

2008	SS	EL
2008	StS	EL
2008	NtS	EL
2008	IS	EL
2007	MS	PC
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
	MS	PC
2008	MS	EL
2008	SS	EL
2008	StS	EL
2008	NtS	EL
2008	IS	EL
2006	SS	NF
2007	MS	PC
2007	StS	EL
2008	IS	EL
2007	SS	EL
2007	StS	EL
2007	NtS	EL
2007	IS	EL
2007	IS	EL
2008	IS	EL
2009	SS	EL
2006	IS	EL
	MS	PC
2007	SS	EL
2007	NtS	EL
2007	IS	EL
2007	SS	EL
2007	NtS	EL
2007	IS	EL
2008	SS	EL
2008	NtS	EL
	SS	PC
	StS	PC
	NtS	PC
	SS	NS



	IS	NS
	SS	NS
	IS	NS
2011	IS	EL
	MS	NS
	NtS	NS
	SS	NS
	IS	NS
2011	MS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
2010	SS	EL
2010	StS	EL
2010	NtS	EL
2010	IS	EL
2013	NtS	EL
	MS	BL
2012	MS	EL
2012	SS	EL
2012	StS	EL
2012	NtS	EL
2012	IS	EL
2013	NtS	EL
2007	NtS	EL
2011	MS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
2012	NtS	EL
	NtS	BL
2012	NtS	EL
2007	NtS	EL
2011	SS	BL
2010	SS	EL
	IS	PC
	MS	NS
2011	MS	EL

2011	IS	EL
2009	NtS	BL
2009	MS	NF
2009	SS	NF
2011	StS	EL
	SS	EL
2012	SS	EL
2012	IS	EL
2010	IS	BL
2012	MS	EL
2013	MS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
2011	IS	NF
2011	MS	BL
2012	MS	NF
2011	MS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
2011	MS	EL
2012	IS	EL
2007	MS	EL
	MS	PC
2012	MS	EL
2011	MS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
2011	MS	BL
2011	MS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
	SS	EL

2013	MS	EL
2013	SS	EL
2013	StS	EL
2013	IS	EL
2015	SS	EL
2015	StS	EL
2015	IS	EL
2012	SS	EL
2012	StS	EL
2012	IS	EL
2012	SS	EL
2012	StS	EL
2012	IS	EL
2013	MS	NF
	MS	NS
	SS	NS
	StS	BL
	StS	BL
	MS	NS
2012	MS	PC
2013	MS	PC
2014	MS	PC
	IS	EL
	StS	BL
	SS	BL
	MS	NS
	MS	EL
2014	MS	PC
2012	MS	EL
	StS	BL
	SS	NS
2009	SS	BL
2014	IS	EL
	MS	NS
	SS	NS
	StS	NS
	NtS	NS
	IS	NS
2014	MS	EL
2014	SS	EL

2014	StS	EL
2014	NtS	EL
2014	IS	EL
2015	MS	EL
2015	SS	EL
2015	StS	EL
2015	NtS	EL
2015	IS	EL
	MS	NS
	MS	PC
	MS	NF
	MS	NF
	MS	BL
2015	MS	NS
2015	SS	NS
2015	StS	NS
2015	NtS	NS
2015	IS	NS
	MS	BL
	MS	PC
	MS	BL
	MS	NS
	MS	NS
	MS	NS
2013	MS	EL
2013	SS	EL
2013	StS	EL
2013	NtS	EL
2013	IS	EL
2014	MS	EL
2014	SS	EL
2014	StS	EL
2014	NtS	EL
2014	IS	EL
2015	MS	BL
2015	MS	NS
2009	SS	NF
2009	StS	NF
2009	NtS	NF
2009	IS	NF

2015	StS	EL
2007	MS	PC
2013	SS	EL
2007	NtS	EL
2007	SS	EL
2014	SS	EL
2012	SS	EL
2012	StS	EL
2012	NtS	EL
2015	StS	EL
2008	StS	EL
	MS	PC
2014	MS	PC
2015	MS	PC
	NtS	PC
2011	SS	EL
2011	StS	EL
2012	NtS	EL
2011	SS	EL
2012	MS	EL
	MS	PC
2010	StS	PC
2011	IS	EL
	SS	EL
	NtS	NS
2014	NtS	EL
2014	MS	PC
2017	MS	PC
2017	SS	PC
2017	StS	PC
2017	NtS	PC
2017	IS	PC
2014	MS	NS
2014	SS	NS
2014	StS	NS
2014	NtS	NS
2014	IS	NS
2014	MS	NS
2014	SS	NS
2014	StS	NS

2014	NtS	NS
2014	IS	NS
2016	MS	BL
2016	SS	EL
2016	StS	EL
2016	NtS	EL
2016	IS	EL
2014	MS	BL
2015	MS	BL
2010	SS	EL
2010	StS	EL
2010	NtS	EL
2010	IS	EL
2017	SS	EL
	MS	PC
2017	SS	EL
2017	StS	EL
2017	NtS	EL
2017	IS	EL
2011	SS	EL
2011	StS	EL
2011	NtS	EL
2011	IS	EL
2013	MS	EL
2013	SS	EL
2013	StS	EL
2013	NtS	EL
2013	IS	EL
2018	NtS	EL
2010	MS	EL
2010	SS	EL
2010	StS	EL
2010	NtS	EL
2010	IS	EL
2013	MS	EL
2013	SS	EL
2013	StS	EL
2013	NtS	EL
2013	IS	EL
2016	SS	EL

2016	StS	EL
2016	NtS	EL
2016	IS	EL
2015	StS	EL
2007	SS	EL
2007	NtS	EL
2015	SS	EL
2014	SS	EL
	MS	PC
	MS	PC
2015	MS	PC
2012	NtS	EL
2011	MS	EL
2010	StS	PC
2016	MS	EL
2016	SS	EL
2016	StS	EL
2016	NtS	EL
2016	IS	EL
	SS	EL
2015	MS	EL
2015	SS	EL
2015	StS	EL
2015	IS	EL
2018	MS	EL
2015	MS	EL
2015	SS	EL
2015	NtS	EL
2018	SS	EL
2011	MS	EL
2017	SS	EL
2018	SS	NF
2014	SS	EL
2014	MS	EL
2014	SS	EL
2015	MS	EL
2015	SS	EL
2015	NtS	EL
2019	MS	EL
2019	SS	EL

2019	MS	EL
2019	SS	EL
1982	SS	EL
2005	SS	EL
2016	SS	EL
1988	SS	EL
2019	SS	EL
2017	SS	NF
2018	SS	NF
2014	SS	EL
2014	SS	EL
2015	SS	EL
2015	StS	EL
2015	NtS	EL
2015	IS	EL
2019	SS	EL
2019	StS	EL
2019	NtS	EL
2019	IS	EL
2018	MS	BL
2020	MS	EL
2018	SS	EL
2018	StS	EL
2018	NtS	EL
2018	IS	EL
2019	NtS	EL
2019	SS	EL
2019	StS	EL
2019	NtS	EL
2019	IS	EL
2014	SS	EL
2014	StS	EL
2014	NtS	EL
2014	IS	EL
2014	SS	EL
2014	StS	EL
2014	NtS	EL
2014	IS	EL
2019	MS	NF
2016	MS	NF



2016	SS	NF
2016	StS	NF
2016	NtS	NF
2016	IS	NF
2019	MS	EL
2019	MS	EL
2019	MS	EL
2017	MS	EL
2018	MS	EL
2015	MS	BL
2016	MS	BL
2014	SS	EL
2014	StS	EL
2014	NtS	EL
2014	IS	EL
2016	SS	EL
2016	StS	EL
2016	NtS	EL
2016	IS	EL
2014	MS	EL
2014	SS	EL
2014	StS	EL
2014	NtS	EL
2014	IS	EL
2016	SS	EL
2016	StS	EL
2016	NtS	EL
2016	IS	EL
2015	MS	EL
2015	SS	EL
2015	StS	EL
2015	NtS	EL
2015	IS	EL
2018	MS	NF
2018	MS	PC
	MS	PC
	MS	PC
2015	MS	EL
2015	SS	EL
2015	StS	EL

2015	NtS	EL
2015	MS	NS
2016	MS	BL
2016	MS	EL
2018	MS	BL
	SS	PC
	MS	NS
	MS	NS
2016	SS	EL
2016	StS	EL
2016	NtS	EL
2016	IS	EL
	MS	NS
2017	MS	BL
2015	MS	EL
2015	SS	EL
2015	StS	EL
2015	NtS	EL
2015	IS	EL
2019	SS	EL
2019	StS	EL
2019	NtS	EL
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2019	MS	EL
2019	SS	EL
2019	StS	EL
2019	NtS	EL
2019	IS	EL
2019	MS	EL
2020	SS	EL
2021	NtS	EL
2020	NtS	EL
2015	SS	EL
2020	NtS	EL
2020	MS	EL
2017	MS	EL
2018	MS	EL
2020	MS	EL
2015	MS	BL
2016	MS	BL

2014	SS	EL
2014	StS	EL
2014	NtS	EL
2014	IS	EL
2020	MS	EL
2019	MS	EL
2019	SS	EL
2019	StS	EL
2019	NtS	EL
2019	IS	EL
2019	MS	EL
2014	MS	EL
2015	MS	EL
2018	MS	NF
2018	MS	NF
	MS	PC
	MS	PC
2015	SS	EL
2015	StS	EL
2015	NtS	EL
2015	IS	EL
2017	IS	EL
2013	MS	EL
2016	MS	EL
2013	SS	EL
2013	StS	EL
2013	NS	EL
2013	IS	EL
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2007	IS	EL
2015	SS	EL
2015	StS	EL
2015	NtS	EL
2015	IS	EL
2017	IS	EL
2011	MS	BL
2012	MS	BL
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2015	MS	EL
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2016	SS	BL
2016	StS	BL
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2018	SS	BL
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2016	IS	EL
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2015	NtS	EL
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2019	NtS	EL
2019	IS	EL
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2019	SS	EL
2019	StS	EL
2019	NtS	EL
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2014	MS	EL
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2019	SS	EL
2019	StS	EL
2019	NtS	EL
2019	IS	EL
2015	SS	EL
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	IS	NS
2020	MS	EL
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2018	MS	EL
2020	SS	EL
2016	StS	EL
2016	NtS	EL
2018	SS	EL
2018	StS	EL
2018	NtS	EL

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Andrae, 2019d

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IDC

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CBRE

CBRE

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CBRE

CEET, 2013

CESI, 2019

Chen et al., 2015

China Cooling Association, 2016

Cisco

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Howard-Healy, 2013

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Huang et al., 2015

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IDC  
Reinsel, 2010  
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Seagate  
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Andrae, 2019b	2
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Andrae, 2019d	17
Andrae, 2019c	19
Montevecchi et al., 2020	8
Andrae, 2019d	17
Andrae, 2019c	19
Andrae, 2020a	23
Andrae, 2020a	23
Montevecchi et al., 2020	8
Andrae, 2020b	21
Andrae, 2020b	21
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Montevecchi et al., 2020	8
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Koomey, 2008	581
Koomey, 2011	1627
Masanet et al., 2011	105
Shehabi et al., 2016	691
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Andrae, 2019b	2
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Andrae, 2019c	19
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Koomey, 2008	581
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Malmodin et al., 2010	277
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Montevecchi et al., 2020	8
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Hintemann, 2020	2
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Hintemann, 2020	2
Masanet et al., 2020	265
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Malmodin et al., 2014	84
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Andrae, 2019c	19
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Liua et al., 2014	23
Bio by Deloitte, 2015	0
Hintemann & Clausen, 2016	26
Shehabi et al., 2016	691
Malmodin & Lunden, 2018a	144
Shehabi et al., 2018	68
The Shift Project, 2019	28
Bio by Deloitte, 2015	0
Van Heddeghem et al., 2014	541
Van Heddeghem et al., 2014	541
Bio by Deloitte, 2015	0
Shehabi et al., 2016	691
Shehabi et al., 2016	691

Shehabi et al., 2018	68
Hintemann & Hinterholzer, 2019	26
Hintemann, 2020	2
Hintemann, 2015a	0
Hintemann & Hinterholzer, 2019	26
Hintemann, 2020	2
Montevecchi et al., 2020	8
Malmodin & Lunden, 2018a	144
Montevecchi et al., 2020	8
Hintemann & Clausen, 2016	26
Shehabi et al., 2016	691
Andrae, 2019b	2
Liua et al., 2014	23
Greenpeace & NCEPU, 2019	0
Masanet et al., 2020	265
Montevecchi et al., 2020	8
GeSI & BCG, 2012	71
Brown et al., 2007	519
Koomey, 2007b	38
Bio Intelligence Service, 2008	11
Koomey, 2008	581
Somavat, Jadhav & Namboodiri, 2010	57
Malmodin et al., 2010	277
Masanet et al., 2011	105
Pickavet et al., 2008	420
Koomey, 2008	581
Malmodin et al., 2010	277
Masanet et al., 2011	105
Koomey, 2011	1627
Masanet et al., 2011	105
Masanet et al., 2020	265
Corcoran & Andrae, 2013	67
Liua et al., 2014	23
Malmodin et al., 2014	84
Van Heddeghem et al., 2014	541
Whitehead et al., 2014	113
Whitney & Delforge, 2014	259
Shehabi et al., 2016	691
Malmodin & Lunden, 2018a	144
Koot & Wijnhoven, 2021	19

Corcoran & Andrae, 2013	67
Andrae, 2019c	19
Shehabi et al., 2016	691
Shehabi et al., 2018	68
Whitney & Delforge, 2014	259
Malmodin & Lunden, 2016	24
Malmodin & Lunden, 2018a	144
Andrae, 2019d	17
Montevecchi et al., 2020	8
Malmodin & Lunden, 2018a	144
GeSI & BCG, 2012	71
Malmodin & Lunden, 2018a	144
Malmodin & Lunden, 2018a	144
Malmodin & Lunden, 2018a	144
Malmodin & Lunden, 2018a	144
Malmodin & Lunden, 2018a	144
Malmodin & Lunden, 2018a	144
Malmodin & Lunden, 2016	24
Koomey, 2007a	762
Koomey, 2007a	762
Montevecchi et al., 2020	8
Whitehead et al., 2014	113
Whitney & Delforge, 2014	259
Shehabi et al., 2016	691
Shehabi et al., 2018	68
Montevecchi et al., 2020	8
Koot & Wijnhoven, 2021	19
Andrae, 2020a	23
Liua et al., 2014	23
Koot & Wijnhoven, 2021	19
Shehabi et al., 2016	691
Masanet et al., 2011	105
Shehabi et al., 2016	691
Vereecken et al., 2010a	171
Corcoran & Andrae, 2013	67
Andrae, 2019c	19
Bio by Deloitte, 2015	0
Malmodin et al., 2014	84
Malmodin & Lunden, 2016	24
Montevecchi et al., 2020	8

Masanet et al., 2020	265
Shehabi et al., 2016	691
Shehabi et al., 2018	68
Malmodin & Lunden, 2016	24
Liua et al., 2014	23
Bio by Deloitte, 2015	0
Koot & Wijnhoven, 2021	19
Shehabi et al., 2016	691
IEA, 2017	15
Malmodin & Lunden, 2018a	144
Shehabi et al., 2018	68
The Shift Project, 2019	28
Masanet et al., 2020	265
Montevecchi et al., 2020	8
Koot & Wijnhoven, 2021	19
Montevecchi et al., 2020	8
Koot & Wijnhoven, 2021	19
Andrae, 2019d	17
Liua et al., 2014	23
Bio by Deloitte, 2015	0
Liua et al., 2014	23
Whitney & Delforge, 2014	259
Shehabi et al., 2016	691
Shehabi et al., 2018	68
Liua et al., 2014	23
The Shift Project, 2019	28
Andrae, 2020a	23
Andrae, 2019c	19
Andrae, 2019b	2
Andrae, 2019c	19
Bertoldi, 2010	5
Shehabi et al., 2016	691
Avgerinou, Bertoldi & Castellazzi, 2017	232
Malmodin & Lunden, 2016	24
Greenpeace & NCEPU, 2019	0
Masanet et al., 2020	265
Hintemann, 2015a	0
Hintemann, 2015b	14
Hintemann & Hinterholzer, 2019	26
Hintemann, 2020	2



Montevecchi et al., 2020	8
Belkhir & Elmeligi, 2018	352
Belkhir & Elmeligi, 2018	352
Corcoran & Andrae, 2013	67
Corcoran & Andrae, 2013	67
Malmodin et al., 2014	84
Bio by Deloitte, 2015	0
Andrae, 2019d	17
Montevecchi et al., 2020	8
The Shift Project, 2019	28
Andrae & Edler, 2015	659
Andrae & Edler, 2015	659
Van Heddeghem et al., 2014	541
Bio by Deloitte, 2015	0
Brown et al., 2007	519
Andrae, 2019d	17
Shehabi et al., 2016	691
Andrae, 2019b	2
Andrae, 2019c	19
Montevecchi et al., 2020	8
Belkhir & Elmeligi, 2018	352
Corcoran & Andrae, 2013	67
Shehabi et al., 2016	691
Andrae, 2019d	17
Andrae, 2019b	2
Andrae, 2019c	19
Andrae, 2020a	23

Year	Source Type
2015	Data without source
2011	Data with source
2019	Paper (Journal)
2019	Paper (Journal)
2019	Paper (Journal)
2019	Paper (Journal)
2020	Paper (Journal)
2020	Paper (Journal)
2020	Paper (Journal)
2020	Paper (Journal)
2019	Paper (Journal)
2019	Report (Self-Published)
2020	Report (Self-Published)
2019	Report (Self-Published)
2019	Report (Self-Published)
2020	Paper (Journal)
2020	Paper (Journal)
2020	Presentation
2020	Paper (Journal)
2020	Paper (Journal)
2014	Report
2016	Report
2018	Report
2021	Paper (Journal)
2012	Data without source
2020	Paper (Journal)
2020	Paper (Journal)
2020	Paper (Journal)
2008	Report
2011	Report
2011	Report
2016	Report
2016	Report
2021	Report
2019	Paper (Journal)
2011	Report

2012	Data without source
2008	Paper (Conference)
2011	Report
2014	Report
2019	Paper (Journal)
2020	Report
2014	Report
2017	Data without source
2008	Report
2008	Report
2010	Report
2010	Report
2011	Report
2011	Report
2014	Report
2016	Report
2018	Report
2011	Report
2012	Report
2019	Report
2020	Report
2020	Report
2019	Report
2020	Report
2020	Report
2020	Report
2020	Report
2013	Report
2019	Report
2018	Paper (Journal)
2019	Report
2012	Data without source
2013	Data with source
2020	Report
2020	Report
2015	Report
2020	Report
2020	Data with source
2021	Data with source
2021	Data with source
2021	Data with source

2021	Data with source
2015	Data with source
2020	Report
2016	Report
2019	Data with source
2019	Data with source
2020	Data with source
2020	Report
2020	Report
2017	Data with source
2019	Data with source
2020	Data with source
2020	Report
2020	Report
2020	Report
2020	Report
2019	Data with source
2019	Report
2020	Data with source
2019	Data with source
2019	Data with source
2020	Report
2020	Report
2020	Report
2021	Report
2007	Report (Draft), Data with source
2015	Report
2020	Report
2013	Paper (Magazine)
2013	Paper (Journal)
2013	Paper (Conference)
2020	Paper (Journal)
2020	Paper (Magazine)
2014	Report
2014	Report
2015	Report
2015	Report
2016	Presentation
2018	Presentation
2020	Report

2015	Data with source
2010	Report
2011	Specification Document
2014	Specification Document
2015	Blog Post
2019	Report
2007	Personal Communications
2012	Data without source
2014	Data without source
2014	Data without source
2019	Personal Communications
2020	Personal Communications
2015	Report
2019	Paper (Journal)
2020	Paper (Journal)
2020	Paper (Journal)
2019	Report
2019	Paper (Conference)
2018	Report
2020	Paper (Journal)
2015	Data with source
2016	Presentation
2016	Data without source
2019	Data without source
2015	Report
2010	Report
2019	News Piece
2020	Data with source
2014	Report
2012	Data without source
2015	Data with source
2020	Report
2007	Report
2008	Report
2011	Report
2020	Report
2015	News Piece
2020	News Piece
2015	Data without source
2019	Paper (Journal)

2019	Paper (Conference)
2020	Paper (Conference)
2020	Paper (Conference)
2015	Primary Data Collection (Survey)
2019	Paper (Conference)
2020	Paper (Conference)
2020	Paper (Conference)
2019	Paper (Conference)
2019	Paper (Journal)
2020	Paper (Journal)
2020	Paper (Journal)
2015	Primary Data Collection (Survey)
2015	Primary Data Collection (Survey)
2019	Book Chapter
2015	Report
2019	Presentation
2020	Report
2020	Report
2015	Data with source
2016	Report
2016	Paper (Conference)
2007	Data with source
2007	Personal Communications
2008	Data with source
2010	Report
2011	Personal Communications
2011	Data with source
2014	Data without source
2015	Report
2016	Data without source
2016	Data with source
2018	Data with source
2018	Data with source, Personal Communications
2019	Data without source
2015	Report
2014	Data without source
2014	Data without source
2015	Report
2016	Data with source
2016	Report

2018	Data with source
2019	Data with source
2020	Data with source
2015	Data without source
2019	Data without source
2020	Data without source
2020	Data without source
2018	Report
2020	Data with source
2016	Data without source
2016	Data without source
2019	Paper (Conference)
2014	Blog Post
2019	Report
2020	Paper (Journal)
2020	Report
2012	Report
2007	Report
2007	Report
2008	Report
2008	Report
2010	Report
2010	Report
2011	Report
2008	Report
2008	Report
2010	Report
2011	Report
2011	Paper (Journal)
2011	Paper (Journal)
2020	Paper (Journal)
2013	Report
2014	Report
2010	Report
2014	Report
2014	Report
2014	Report
2016	Report
2018	Report
2021	Report

2013	Paper (Journal)
2019	Paper (Journal)
2016	Paper (Journal)
2018	Paper (Journal)
2014	Blog Post
2016	Paper (Conference)
2018	Paper (Conference)
2019	Paper (Journal)
2020	Paper (Journal)
2018	Report
2012	Paper (Journal)
2018	Paper (Journal)
2018	Paper (Conference)
2018	Paper (Conference)
2018	Paper (Conference)
2018	Paper (Conference)
2018	Paper (Conference)
2016	Paper (Journal)
2007	Paper (Conference)
2007	Data without source
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2014	Paper (Journal)
2014	Paper (Journal)
2016	Paper (Journal)
2018	Paper (Conference)
2020	Paper (Journal)
2021	Paper (Journal)
2020	Paper (Journal)
2014	Report
2021	Report
2016	Report
2011	Personal Communications
2016	Personal Communications
2010	Paper (Conference)
2010	Paper (Conference)
2019	Book Chapter
2015	Data with source
2010	Data with source
2016	Data with source
2020	Report



2020	Report
2016	Report
2018	Report
2016	Data without source
2014	Report
2015	Data with source
2021	Paper (Journal)
2016	Paper (Journal)
2017	Report
2018	Report
2018	Report
2019	Report
2020	Report
2020	Report
2021	Report
2020	Paper (Journal)
2021	Paper (Journal)
2019	Paper (Conference)
2014	Report
2015	Data with source
2014	Data with source
2014	Data with source
2016	Data with source
2018	Data with source
2014	Report
2019	Data without source
2020	Book Chapter
2019	Presentation
2019	Presentation
2019	Presentation
2010	Primary Data Collection (Survey)
2016	Primary Data Collection (Survey)
2017	Primary Data Collection (Survey)
2016	Data with source
2019	Report
2020	Data with source
2015	Data without source
2015	Data without source
2019	Data without source
2020	Data without source

2020	Data without source
2018	Data with source
2018	Data with source
2013	Data with source
2013	Report
2010	Report
2015	Report
2019	Report
2020	Report
2019	Report
2015	News Piece
2015	Paper (Conference)
2014	Report
2015	Report
2007	Report (Draft)
2019	Paper (Journal)
2016	Paper (Journal)
2019	Paper (Journal)
2019	Paper (Journal)
2020	Paper (Journal)
2018	Paper (Journal)
2013	Report
2016	Report
2019	Paper (Journal)
2019	Paper (Journal)
2019	Paper (Journal)
2020	Paper (Journal)

Source Year	Source Use (Grouped)	Source Reliability
n/a	MS, SS, StS, NtS, IS	NS
2006	SS	NF
2015	MS, SS, StS, IS	EL
2015	MS, SS, NtS	EL
2015	MS, SS, NtS	EL
2015	MS, SS, StS, NtS	EL
2015	MS, SS, StS, NtS, IS	EL
2015	SS	EL
2015	SS, StS, NtS, IS	EL
2015	SS, StS, NtS, IS	EL
2015	SS, StS, NtS, IS	EL
2019	MS, SS	EL
2019	SS, StS, NtS, IS	EL
2019	SS, StS, NtS, IS	EL
2019	MS, SS	EL
2019	SS, StS, NtS, IS	EL
2019	MS, SS, StS, NtS, IS	EL
2019	SS, StS, NtS, IS	EL
2020	NtS	EL
2020	MS	EL
2011	SS	BL
2015	StS	EL
2015	StS	EL
2018	NtS	EL
n/a	SS, IS	NS
2017	IS	EL
2017	SS, StS, NtS, IS	EL
2017	IS	EL
2007	MS	PC
2007	MS	PC
2007	MS	PC
2007	MS	PC
2013	SS	EL
2013	IS	EL
2018	SS	EL
2007	StS	EL

n/a	SS, IS	NS
2007	IS	EL
2008	IS	EL
2012	IS	EL
1982	SS	EL
2015	SS, StS, NtS, IS	EL
2010	SS	EL
2014	MS, SS, StS, NtS, IS	NS
2007	MS, SS, StS, NtS, IS	EL
2007	MS, StS, NtS	EL
2007	SS, StS, NtS, IS	EL
2007	SS, StS, NtS, IS	EL
2007	SS, StS, NtS, IS	EL
2007	SS, StS, NtS, IS	EL
2007	MS	EL
2007	SS, NtS	EL
2007	SS, NtS	EL
2008	IS	EL
2011	IS	EL
2017	MS	EL
2017	MS	EL
2017	MS	EL
2018	MS	EL
2018	MS	EL
2018	MS	EL
2020	MS	EL
2013	NtS	EL
2019	MS	NF
2015	SS	EL
2016	MS, SS, StS, NtS, IS	NF
n/a	MS, NtS	NS
n/a	MS	BL
2011	MS	BL
2012	MS	BL
2013	MS	EL
2013	MS	BL
2013	MS	EL
2013	MS	EL
2013	SS	EL
2013	StS	EL

2013	NtS	EL
2013	MS	NF
2014	MS	BL
2015	MS	BL
2015	MS	BL
2015	MS	NS
2015	MS	BL
2015	MS	EL
2015	MS	BL
2016	MS	BL
2016	MS	BL
2016	MS	BL
2016	MS	BL
2016	SS	BL
2016	StS	BL
2016	MS	BL
2016	MS	BL
2016	MS	EL
2016	MS	EL
2018	MS	BL
2018	MS	BL
2018	MS	BL
2018	SS	BL
2018	StS	BL
2020	MS	EL
2007	MS	PC
2013	SS, StS, IS	EL
2013	SS, StS, NtS, IS	EL
2012	MS, SS, StS, NtS, IS	EL
2013	NtS	EL
2007	NtS	EL
2007	SS, StS, NtS, IS	EL
2020	MS	EL
2011	MS	BL
2012	MS	NF
2013	MS	NF
2013	MS	NF
2014	SS	EL
2014	SS	EL
2019	SS, StS, NtS, IS	EL

n/a	MS, SS	NS
2009	NtS	EL
2009	SS	EL
2010	IS	BL
n/a	StS	BL
2018	MS	EL
n/a	SS, NtS	PC
n/a	SS	PC
n/a	IS	PC
n/a	MS	PC
n/a	SS	PC
n/a	IS	PC
2011	MS	BL
2014	SS, StS, NtS, IS	EL
2014	SS, StS, NtS, IS	EL
2014	MS, SS, StS, NtS, IS	EL
2019	MS	EL
2005	SS	EL
2017	SS	EL
2020	SS	EL
n/a	StS	BL
2012	SS, StS, NtS	EL
n/a	MS	NS
n/a	MS	NS
n/a	MS	PC
2007	MS	BL
2020	MS	EL
2020	MS	EL
2012	MS	EL
n/a	IS	NS
n/a	IS	EL
2019	IS	EL
2006	IS	EL
2006	IS	EL
2006	IS	EL
2019	MS	EL
2015	SS, StS, NtS	EL
2015	SS, StS, NtS, IS	EL
n/a	StS	BL
2011	MS	EL

2016	SS, StS, NtS, IS	EL
2019	MS, SS, StS, NtS, IS	EL
2019	MS, SS, StS, NtS, IS	EL
2014	MS, SS, StS, NtS, IS	EL
2014	MS, SS, StS, NtS, IS	EL
2014	MS	EL
2014	MS	EL
2016	SS, StS, NtS, IS	EL
2015	MS, SS, StS, NtS, IS	EL
2015	MS	EL
2015	MS	EL
2015	MS, SS, StS, NtS, IS	EL
2015	MS, SS, StS, NtS, IS	EL
2016	SS	EL
2013	MS	BL
2018	MS	NF
2018	MS	NF
2018	MS	NF
n/a	SS	BL
2015	StS	EL
2008	StS	EL
n/a	MS	PC
n/a	IS	PC
n/a	MS	PC
2006	MS	PC
n/a	MS	PC
n/a	MS	PC
n/a	MS	NS
n/a	MS	NS
n/a	MS	NS
n/a	MS	PC
n/a	MS	PC
n/a	MS	PC
n/a	MS	NS
2010	MS	EL
2012	MS	EL
2013	MS	EL
2014	MS	PC
2014	MS	PC
2015	MS	PC

2015	MS	PC
2018	MS	PC
2018	MS	NF
n/a	MS	NS
n/a	MS	PC
n/a	MS	PC
n/a	MS	PC
2017	SS, StS, NtS, IS	EL
2019	SS, StS, NtS, IS	EL
n/a	MS	NS
n/a	NtS	PC
2017	SS	EL
2011	MS	EL
2019	MS	EL
2018	MS	EL
2015	SS, StS, NtS, IS	EL
2011	MS, SS, StS, NtS, IS	EL
2007	SS, IS	EL
2007	MS, SS, IS	EL
2007	MS, SS, StS, NtS, IS	EL
2007	SS	EL
2007	MS	EL
2007	SS, StS, NtS, IS	EL
2007	SS, NtS, IS	EL
2007	MS, SS, StS, NtS, IS	EL
2007	SS	EL
2007	SS, StS, NtS, IS	EL
2007	SS, NtS, IS	EL
2008	MS, SS, StS, NtS, IS	EL
2008	SS, NtS	EL
2018	MS	EL
2011	MS, SS, StS, NtS, IS	EL
2011	IS	EL
2011	SS, StS, NtS, IS	EL
2011	SS, StS, NtS, IS	EL
2011	MS, SS, StS, NtS, IS	EL
2011	MS, SS, StS, NtS, IS	EL
2011	SS, StS	EL
2011	SS, StS, NtS, IS	EL
2015	MS	EL



2012	NtS	EL
1988	SS	EL
2012	NtS	EL
2012	NtS	EL
2011	MS	BL
2013	MS, SS, StS, NtS, IS	EL
2013	MS, SS, StS, NtS, IS	EL
2018	SS, StS, NtS, IS	EL
2018	MS	EL
2018	NtS	EL
2010	SS, StS, NtS, IS	EL
2010	MS, SS, StS, NtS, IS	EL
2013	MS	EL
2013	SS	EL
2013	StS	EL
2013	NtS	EL
2013	IS	EL
2014	MS, SS, StS, NtS, IS	EL
2006	IS	EL
n/a	SS	NS
n/a	SS, StS, NtS, IS	NS
2011	MS	EL
2011	MS, SS, StS, NtS, IS	EL
2011	SS	EL
2011	MS	EL
2020	MS	EL
2020	MS, SS, StS, NtS	EL
2020	SS	EL
2009	NtS	BL
2018	MS	EL
2012	MS	EL
n/a	SS, StS, NtS	PC
n/a	MS	PC
2008	MS, SS, StS, NtS, IS	EL
2008	MS, SS, StS, NtS, IS	EL
2019	SS	EL
2012	MS	EL
n/a	MS	BL
2015	MS	BL
2019	SS, StS, NtS, IS	EL

2018	MS, StS	EL
2010	StS	PC
2010	StS	PC
2015	MS	NS
2009	MS, SS	NF
n/a	StS	BL
2020	SS	EL
2011	IS	EL
2016	SS, StS, NtS, IS	EL
2016	SS, StS, NtS, IS	EL
2016	MS, SS, StS, NtS, IS	EL
2016	SS, StS, NtS, IS	EL
2016	MS, SS, StS, NtS, IS	EL
2016	MS, SS, StS, NtS, IS	EL
2016	StS, NtS	EL
2018	SS, StS, NtS, IS	EL
2018	SS, StS, NtS	EL
2019	NtS	EL
2011	StS	EL
n/a	SS	NS
n/a	SS	EL
n/a	SS	EL
n/a	SS	EL
n/a	SS	EL
2012	SS, IS	EL
n/a	MS	NS
2021	NtS	EL
2017	SS	NF
2018	SS	NF
2018	SS	NF
n/a	MS, SS, StS, NtS, IS	NS
n/a	NtS	NS
2017	MS, SS, StS, NtS, IS	PC
2009	SS, StS, NtS, IS	NF
2019	MS	EL
2019	MS, SS	EL
n/a	MS	PC
n/a	MS	PC
n/a	MS	PC
n/a	MS	PC

n/a	MS	PC
2014	MS	BL
2015	MS	BL
n/a	NtS	BL
2012	NtS	EL
2008	MS	NS
2009	SS	BL
2019	SS, StS, NtS, IS	EL
2019	SS, StS, NtS, IS	EL
2017	MS	BL
2012	SS, StS, IS	EL
2012	SS, StS, IS	EL
2011	IS	NF
2014	IS	EL
n/a	IS	NF
2014	SS, StS, NtS, IS	EL
2014	NtS	EL
2014	SS	EL
2014	SS	EL
2014	SS, StS, NtS, IS	EL
2010	SS, StS, NtS, IS	EL
2007	NtS	EL
2014	MS	PC
2014	SS, StS, NtS, IS	EL
2014	MS, SS	EL
2014	SS	EL
2020	NtS	EL

## Source Use Count

5  
1  
4  
3  
3  
4  
5  
1  
4  
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2  
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## Unique Sources

AC4DC  
Advanced Micro Devices  
Andrae & Edler, 2015  
Andrae, 2019a  
Andrae, 2019b  
Andrae, 2019c  
Andrae, 2019d  
Andrae, 2019e  
Andrae, 2020a  
Arnclan Computer Services, 2011  
ASHRAE, 2015  
Aslan et al., 2018  
ATandT  
Avgerinou, Bertoldi & Castellazzi, 2017  
Barroso et al., 2013  
Bashroush, 2018  
Battles et al., 2007  
BCG  
Belady & Malone, 2007  
Belady et al., 2008  
Bennett & Delforge, 2012  
Bennett, 1982  
Bio by Deloitte, 2015  
Bozman & Broderick, 2010  
BroadGroup, 2014  
Brown et al., 2007  
Brown et al., 2008  
Carbon Disclosure Project, 2011  
CBRE  
CEET, 2013  
CESI, 2019  
Chen et al., 2015  
China Cooling Association, 2016  
Cisco  
Corcoran & Andrae, 2013  
Corcoran, 2012

2	Coroama et al., 2013
1	Cucchietti et al., 2007
1	Dagher, Marcellin & Neifeld, 2007
1	Daly et al., 2020
1	DCD, 2011
4	DCD, 2012
1	DCD, 2013a
5	DCD, 2013b
5	Dietrich, 2014
3	Digiconomist, 2019
4	DIGITALEUROP
4	Donovan, 2009
4	Energy Star, 2009
4	Energy Star, 2010
1	Enterprise Storage Forum
2	Ericsson, 2018
2	Expert Interviews
1	Experton, 2011
1	Fichter & Hintemann, 2014
1	FIRI, 2019
1	Frank, 2005
1	Fuchs et al., 2017
1	Fuchs et al., 2020
1	Fujitsu
1	Garnier, 2012
1	Gartner
1	GeSI & BCG, 2012
1	Google
1	Google, 2019
5	Greenberg et al., 2006
2	Greenpeace & NCEPU, 2019
1	Hachman, 2015
1	HGST
1	Hilbert & Lopez, 2011
1	Hintemann & Clausen, 2016
1	Hintemann & Hinterholzer, 2019
1	Hintemann et al., 2014
1	Hintemann et al., 2016
1	Hintemann, 2015
1	Hintemann, 2015b

1	Hoefflinger, 2016
1	Howard-Healy, 2013
1	Howard-Healy, 2018
1	HP
1	Huang et al., 2015
1	Hylick et al., 2008
1	IDC
1	IDC/EITO
1	IEA, 2017
1	IEA, 2019
1	IHS
1	Industry Comment
1	Ionescu, 2017
1	Kaskade, 2011
1	Kezhi Consulting, 2019
1	Kief & Victora, 2018
1	Koomey & Taylor, 2015
1	Koomey 2011
1	Koomey, 2007
1	Koomey, 2008
1	Koomey, 2011
1	Kuckelhaus et al., 2015
1	Lambert et al., 2012
1	Landauer, 1988
1	Lanzisera et al., 2012
1	Lorenz, 2011
3	Lunden & Malmodin, 2013
4	Malmodin & Lunden, 2016
5	Malmodin & Lunden, 2018a
1	Malmodin & Lunden, 2018b
1	Malmodin et al., 2010
4	Malmodin et al., 2013
1	Malmodin et al., 2014
1	Malone & Belady, 2006
1	Manufacturing Data
1	Masanet et al., 2011
1	Masanet et al., 2020
1	Mitchell & York, 2020
1	NetApp, 2009
4	NL Times, 2018

2	NRDC & WSP, 2012
1	Personal Communication
1	Pickavet et al., 2008
1	Porod, 2019
1	PRODCOM, 2012
1	PTS
2	Rauchs et al., 2019
1	Reinsel, 2010
1	SCB, 2015
1	Schappi et al., 2009
1	Seagate
1	Shalf, 2020
1	Shehabi et al., 2011
4	Shehabi et al., 2016
4	Shehabi et al., 2018
5	SNIA, 2011
1	SPEC
1	Stansberry & Kudritzki, 2012
1	Statista
1	Stobbe et al., 2021
1	Summers, 2017
3	Summers, 2018
1	Survey
1	Swedish Energy Agency, 2009
1	Synergy Research Group, 2019
1	Techconsult
1	Technavio, 2014
1	Technavio, 2015
1	Telecom Italia
1	Telecom Italia, 2012
1	TeliaSonera, 2008
1	The Green Grid, 2009
1	The Shift Project, 2019
1	The Zettabyte Era, 2017
1	Time Magazine, 2012
1	Tucker et al., 2012
3	Uptime institute, 2011
4	Uptime Institute, 2014
1	US EPA
1	Van Heddeghem et al., 2014

Vereecken et al., 2010b  
Verizon Communications, 2010  
Xu, 2014  
Zhang et al., 2020  
Shi et al., 2019



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Unique Sources (Reliability)	Unique Sources (Type)
NS	Data without source
NF	Data with source
EL	Paper (Journal)
EL	Report (Self-Published)
EL	Report (Self-Published)
EL	Paper (Journal)
EL	Paper (Journal)
EL	Presentation
EL	Paper (Journal)
BL	Report
EL	Report
EL	Paper (Journal)
NS	Data without source
EL	Paper (Journal)
EL	Report
EL	Paper (Journal)
EL	Report
NS	Data without source
EL	Paper (Conference)
EL	Report
EL	Report
EL	Paper (Journal)
EL	Report
EL	Report
NS	Data without source
EL	Report
EL	Report
EL	Report
EL	Report
EL	Report
NF	Report
EL	Paper (Journal)
NF	Report
NS	Data without source
EL	Report
EL	Paper (Magazine)

EL	Paper (Journal)
EL	Paper (Conference)
EL	Paper (Journal)
EL	Paper (Magazine)
BL	Report
NF	Report
NF	Report
NF	Report
EL	Presentation
EL	Report
NS	Data with source
EL	Report
EL	Specification Document
BL	Specification Document
BL	Blog Post
EL	Report
PC	Personal Communications
BL	Report
EL	Paper (Journal)
EL	Report
EL	Paper (Conference)
EL	Report
EL	Paper (Journal)
BL	Data with source
EL	Presentation
NS	Various
EL	Report
NS	Data without source
EL	Report
EL	Report
EL	Report
EL	News Piece
BL	Data without source
EL	Paper (Journal)
EL	Paper (Conference)
EL	Paper (Conference)
EL	Primary Data Collection (Survey)
EL	Paper (Conference)
EL	Paper (Journal)
EL	Primary Data Collection (Survey)

EL	Book Chapter
BL	Report
NF	Presentation
BL	Data with source
EL	Report
EL	Paper (Conference)
PC	Various
NS	Data without source
EL	Report
EL	Data with source
NS	Data without source
PC	Data without source
EL	Paper (Conference)
EL	Blog Post
EL	Report
EL	Paper (Journal)
EL	Report
EL	Report
EL	Report
EL	Paper (Journal)
EL	Report
EL	Report
EL	Paper (Journal)
EL	Paper (Journal)
EL	Paper (Journal)
BL	Blog Post
EL	Paper (Conference)
EL	Paper (Conference)
EL	Paper (Journal)
EL	Report
EL	Paper (Journal)
EL	Paper (Conference)
EL	Paper (Journal)
EL	Paper (Conference)
NS	Data without source
EL	Paper (Journal)
EL	Paper (Journal)
EL	Paper (Journal)
BL	Report
EL	Report

EL	Report
PC	Personal Communications
EL	Paper (Conference)
EL	Book Chapter
EL	Data with source
BL	Data with source
EL	Report
PC	Report
NS	Data without source
NF	Report
BL	Data with source
EL	Paper (Journal)
EL	Paper (Journal)
EL	Report
EL	Paper (Journal)
EL	Report
NS	Data with source
EL	Report
NS	Data without source
EL	Book Chapter
NF	Presentation
NF	Presentation
NS	Primary Data Collection (Survey)
NF	Data with source
EL	Report
PC	Data without source
BL	Data with source
BL	Data with source
BL	Data with source
EL	Report
NS	Report
BL	Report
EL	Report
BL	Report
EL	News Piece
EL	Paper (Conference)
NF	Report
EL	Report
NF	Report (Draft)
EL	Paper (Journal)



EL	Paper (Journal)
EL	Report
EL	Paper (Journal)
EL	Paper (Journal)
EL	Paper (Conference)









Source Year	Times Cited	Source Year (no blanks)
	1	2006
2006	1	2015
2015	9	2019
2019	3	2019
2019	1	2019
2019	1	2019
2019	1	2019
2019	1	2019
2020	2	2020
2011	1	2011
2015	2	2015
2018	1	2018
	1	2017
	1	2013
2017	3	2018
2013	2	2007
2018	1	2007
2007	1	2008
	1	2012
2007	1	1982
2008	1	2015
2012	1	2010
1982	1	2014
2015	1	2007
2010	1	2008
2014	1	2011
2007	9	2013
2008	1	2019
2011	1	2015
	7	2016
2013	1	2013
2019	1	2012
2015	1	2013
2016	1	2007
	35	2007
2013	2	2020
2012	1	2011

2013	1	2012
2007	1	2014
2007	1	2019
2020	1	2009
2011	1	2009
2012	1	2010
2013	1	2018
2013	1	2014
2014	2	2019
2019	1	2005
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2009	1	2020
2009	1	2012
2010	1	2012
	1	2019
2018	1	2006
	6	2019
2011	1	2015
2014	3	2011
2019	1	2016
2005	1	2019
2017	1	2014
2020	1	2016
	1	2015
2012	1	2015
	6	2016
2012	1	2018
	2	2015
2019	1	2008
2006	3	2017
2019	1	2019
2015	2	2017
	1	2011
2011	1	2019
2016	1	2018
2019	2	2011
2014	4	2015
2016	1	2008
2015	3	2011
2015	2	2015

2016	1	2012
2013	1	1988
2018	3	2012
	1	2011
2015	1	2013
2008	1	2013
	29	2018
	4	2018
2017	1	2010
2019	1	2013
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	1	2006
2017	1	2011
2011	1	2020
2019	1	2020
2018	1	2009
2015	1	2018
2011	1	2012
2007	11	2008
2008	3	2019
2011	8	2019
2015	1	2010
2012	1	2015
1988	1	2009
2012	2	2020
2011	1	2011
2013	1	2016
2013	1	2018
2018	2	2011
2018	1	2012
2010	2	2021
2013	5	2017
2014	1	2018
2006	1	2009
	2	2019
2011	4	2014
2020	2	2015
2020	1	2012
2009	1	2008
2018	1	2019



2012	1	2017
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2009	1	2019
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2011	1	
2016	7	
2018	2	
2011	1	
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2012	1	
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2021	1	
2017	1	
2018	2	
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2009	1	
2019	2	
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2020	1
2019	1

## Source Type

Paper (Journal)  
Paper (Conference)  
Paper (Magazine)  
Book Chapter  
Report (Draft)  
Report (Self-Published)  
Report  
Specification Document  
Blog Post  
News Piece  
Data with source  
Data without source  
Personal Communications  
Primary Data Collection (Survey)  
Primary Data Collection (Measurements)  
Presentation

## Notes

Peer-reviewed

Peer-reviewed

Peer-reviewed

May include peer-reviewed publications

Data with an identifiable source (not necessarily accessible)

Data without an identifiable source (not necessarily accessible)

Surveys can be interviews as well as desktop studies

Authors	Cited by
Koomey, 2011	1627
Koomey, 2007a	762
Shehabi et al., 2016	691
Andrae & Edler, 2015	659
Koomey, 2008	581
Van Heddeghem et al., 2014	541
Brown et al., 2007	519
Pickavet et al., 2008	420
Belkhir & Elmeligi, 2018	352
Malmodin et al., 2010	277
Masanet et al., 2020	265
Whitney & Delforge, 2014	259
Avgerinou, Bertoldi & Castellazzi, 2017	232
Vereecken et al., 2010a	171
Malmodin & Lunden, 2018a	144
Whitehead et al., 2014	113
Masanet et al., 2011	105
Malmodin et al., 2014	84
GeSI & BCG, 2012	71
Shehabi et al., 2018	68
Corcoran & Andrae, 2013	67
Somavat, Jadhav & Namboodiri, 2010	57
Koomey, 2007b	38
The Shift Project, 2019	28
Hintemann & Clausen, 2016	26
Hintemann & Hinterholzer, 2019	26
Malmodin & Lunden, 2016	24
Liu et al., 2020	24
Liua et al., 2014	23
Andrae, 2020a	23
Andrae, 2020b	21
Andrae, 2019c	19
Koot & Wijnhoven, 2021	19
Bertoldi, Avgerinou & Castellazzi, 2017	18
Andrae, 2019d	17
IEA, 2017	15
Hintemann, 2015b	14
Andrae, 2019a	12

Bio Intelligence Service, 2008	11	
Montevecchi et al., 2020	8	
Bertoldi, 2010	5	
Andrae, 2019b	2	
Hintemann, 2020	2	
Bio by Deloitte, 2015	0	Not found
Hintemann, 2015a	0	Not found
Greenpeace & NCEPU, 2019	0	Not found

*Please note that these citation count values are at time of reporting in February 2021*

## Citation grouping ( $\geq$ )

1000

500

100

0





Overall Stats

Total papers assessed	46
Total unique sources (IDC & Cisco grouped)	161
Range of paper years	2007 - 2021
Range of source years	1982 - 2021
Total 1-1 mappings (grouped source use, not individual DC categories)	343

	MS	SS	StS	NtS	IS
Source use category connections (totals)	181 (27%)	152 (22%)	109 (16%)	116 (17%)	117 (17%)
Source use individually grouped connections (totals)	All 34	> 4 81	1 231		

Helpful descriptive stats (IDC and Cisco ungrouped)

Most relied on source (databases ungrouped)	IDC	
Most common source use	MS	
Most common source years (1st and 2nd)	n/a	2019 (if 'n/a', these are sources not from official publications)
Most common source type	Report	
Percentage of peer-reviewed sources (All, Conferences)	31%	9%
Percentage of 'Report' sources	38%	
Percentage of 'Data' sources	19%	
Percentage of sources with 'BL', 'NS', 'PC'	25%	
Percentage of sources with only 'PC'	4%	
Percentage of sources with only 'NS'	10%	
Percentage of sources with only 'BL'	11%	
Percentage of sources before:	1990	1%

Source Diversity (Author names can be changed if required)

Source	% of connections (1- 1, grouped)	Publications cited by	Publications cited by (%)
IDC	9.6	20	43%
Cisco	10.2	14	30%
Koomey	7.0	20	43%
Andrae	5.8	10	22%
Hintemann	4.7	5	11%
Gartner	1.7	6	13%

*There are a total of 105 single-source connections*

Single source connections	31%
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