

Table S1. Material composition of electronic devices. Data from “Sustainable Materials Management for the Evolving Consumer Technology Ecosystem” by Babbitt, Altaf, and Chen 2017 [1]. Numbers represent US 2015 stocks and masses except those with an asterisk indicating that the mass value is from 2008.

	Mass (per unit, kg))	Percent of Unit's Mass											
		Ferrous Metal	Al	Cu	Other Metals	Plastic	PC B	Flat Panel Display Module CCFL	Flat Panel Display Module LED	CRT Glass	CRT Lead	Battery	Other
Blu-Ray	4	0.59	0.01	0.04	0	0.17	0.19	0	0	0	0	0	0.01
DVD Player	4	0.59	0.01	0.04	0	0.17	0.19	0	0	0	0	0	0.01
VCR*	5	0.53	0.03	0.03	0.01	0.24	0.15	0	0	0	0	0	0.02
MP3	0.6	0.11	0.38	0.02	0	0.05	0.1	0.07	0	0	0	0.14	0.14
Digital Camcorder	1.1	0.1	0.09	0.04	0	0.42	0.09	0.08	0	0	0	0.07	0.11
Digital Camera	0.13	0.1	0.09	0.04	0	0.42	0.09	0.08	0	0	0	0.07	0.11
Gaming Console	3.7	0.36	0.12	0.02	0	0.34	0.16	0	0	0	0	0	0.01
LED TV	7.8	0.43	0	0	0	0.31	0.02	0	0.23	0	0	0	0.01
LCD TV	12.1	0.37	0.01	0	0	0.32	0.08	0.22	0	0	0	0	0
Plasma TV	22.6	0.34	0.15	0.01	0.01	0.12	0.06	0.32	0	0	0	0	0
CRT TV*	45.6	0.06	0.01	0.02	0	0.21	0.1	0	0	0.54	0.06	0	0
LED Monitor	3.7	0.38	0.03	0.05	0	0.25	0.06	0.21	0	0	0	0	0.02
LCD Monitor	5.7	0.38	0.03	0.05	0	0.25	0.06	0.21	0	0	0	0	0.02
CRT Monitor*	20.1	0.03	0.01	0.04	0.01	0.17	0.12	0	0	0.56	0.06	0	0
Printer	8.1	0.37	0	0.01	0	0.58	0.03	0	0	0	0	0	0.01
Laptop	2.2	0.1	0.12	0.02	0.06	0.25	0.15	0.18	0	0	0	0.14	0.02
Desktop	9.9	0.58	0.11	0.04	0	0.12	0.14	0	0	0	0	0	0.02

E-reader	0.91	0.04	0.1	0.0 2	0	0.28	0.1	0.13	0	0	0	0.2	0.16
Tablet	0.59	0.04	0.1	0.0 2	0	0.28	0.1	0.13	0	0	0	0.2	0.16
Smart Phone	0.13	0	0.2	0.0 2	0.06	0.15	0.1	0.15	0	0	0	0.18	0.15
Basic Phone	0.11	0.01	0.0 5	0.0 2	0	0.33	0.1 7	0.09	0	0	0	0.26	0.07

Table S2. Mass of material contained in electronic stocks per household. Data from “Sustainable Materials Management for the Evolving Consumer Technology Ecosystem” by Babbitt, Altaf, and Chen 2017 [1]. Numbers represent US 2015 stocks and masses except those with an asterisk indicating that the mass value is from 2008.

	Units per Household	Mass per Household (kg)											
		Ferrous Metal	Aluminum	Copper	Other Metals	Plastic	PCB	Flat Panel Display Module CCFL	Flat Panel Display Module LED	CRT Glass	CRT Lead	Battery	Other
Blu-Ray	0.46	1.0856	0.0184	0.0736	0	0.3128	0.3496	0	0	0	0	0	0.0184
DVD	1.1	2.596	0.044	0.176	0	0.748	0.836	0	0	0	0	0	0.044
VCR*	0.35	0.9275	0.0525	0.0525	0.0175	0.42	0.2625	0	0	0	0	0	0.035
MP3	0.78	0.05148	0.17784	0.00936	0	0.0234	0.0468	0.03276	0	0	0	0.06552	0.06552
Digital Camcorder	0.29	0.0319	0.02871	0.01276	0	0.13398	0.02871	0.02552	0	0	0	0.02233	0.03509
Digital Camera	0.83	0.01079	0.009711	0.004316	0	0.045318	0.009711	0.008632	0	0	0	0.007553	0.011869
Gaming Console	0.79	1.05228	0.35076	0.05846	0	0.99382	0.46768	0	0	0	0	0	0.02923
LED TV	0.4	1.3416	0	0	0	0.9672	0.0624	0	0.7176	0	0	0	0.0312

LCD TV	1.1	4.9247	0.133 1	0	0	4.25 92	1.06 48	2.9282	0	0	0	0	0
Plasma TV	0.04	0.30736	0.135 6	0.00 904	0.0090 4	0.10 848	0.05 424	0.28928	0	0	0	0	0
CRT TV*	0.53	1.45008	0.241 68	0.48 336	0	5.07 528	2.41 68	0	0	13.05 072	1.450 08	0	0
LED Monitor	0.16	0.22496	0.017 76	0.02 96	0	0.14 8	0.03 552	0.12432	0	0	0	0	0.01 184
LCD Monitor	0.55	1.1913	0.094 05	0.15 675	0	0.78 375	0.18 81	0.65835	0	0	0	0	0.06 27
CRT Monitor*	0.35	0.21105	0.070 35	0.28 14	0.0703 5	1.19 595	0.84 42	0	0	3.939 6	0.422 1	0	0
Printer	1.1	3.2967	0	0.08 91	0	5.16 78	0.26 73	0	0	0	0	0	0.08 91
Laptop	1.1	0.242	0.290 4	0.04 84	0.1452	0.60 5	0.36 3	0.4356	0	0	0	0.33 88	0.04 84
Desktop	0.74	4.24908	0.805 86	0.29 304	0	0.87 912	1.02 564	0	0	0	0	0	0.14 652
E-reader	0.3	0.01092	0.027 3	0.00 546	0	0.07 644	0.02 73	0.03549	0	0	0	0.05 46	0.04 368
Tablet	1.1	0.02596	0.064 9	0.01 298	0	0.18 172	0.06 49	0.08437	0	0	0	0.12 98	0.10 384
Smart Phone	2.3	0	0.059 8	0.00 598	0.0179 4	0.04 485	0.02 99	0.04485	0	0	0	0.05 382	0.04 485
Basic Phone	0.7	0.00077	0.003 85	0.00 154	0	0.02 541	0.01 309	0.00693	0	0	0	0.02 002	0.00 539

Table S3. Material recovery percentages from recycling and material prices (2018).

	Recovery (%)	Recovery Sources	Price (USD/kg)	Price Sources
Ferrous Metal	93	[2]	\$ 0.35	[3]
Aluminum	87	[2]	\$ 2.16	[4]
Copper	88	[2]	\$ 6.58	[4]
Other Metals	62	[2]	\$ 12.22	[3]
Plastic	84	[2]	\$ 0.05	[5]
PCB	100	-	\$ 3.53	[6]
Flat Panel Display Module CCFL	100	-	\$ -	-
Flat Panel Display Module LED	100	-	\$ -	-
CRT Glass	98	[2]	\$ -	-
CRT Lead	100	-	\$ 2.38	[3]
Battery	100	-	\$ 0.86	[5]
Other	100	-	\$ -	-

Table S4. Energy and greenhouse gas (GHG) values for primary production versus secondary production (recycling). The delta values show the difference between primary and secondary production of the materials which were used in the “savings” calculations. “Other metals” was assumed to be an average of Ni, Zn, and Sn, as described in the main text, and therefore the data for those calculations can be seen in S5. Similarly, the GHG values for PCBs are estimated based on the gold, silver, copper and zinc they contain, and the data for those calculations can be seen in S6. All data in Table S4 comes from Ashby’s “Materials and the Environment Eco-Informed Material Choice” [7], with the exception of the PCB energy delta which comes from Wang *et al.* [8]. The asterisks indicate that only data on the energy differential was available.

	Energy Primary (MJ/kg)	Energy Secondary (MJ/kg)	Energy Delta (MJ/kg)	GHG Primary (kg/kg)	GHG Secondary (kg/kg)	GHG Delta (kg/kg)
Ferrous Metal	47.8	9.3	38.5	2.9	0.6	2.3
Aluminum	200-220	22-30	184	11-13	1.9-2.3	9.9
Copper	56-62	12-15	45.5	3.5-3.9	0.75-0.9	2.875
Other Metals	39.71	6.015	33.695	3.125	0.396	2.729
Plastic	87.3	41.5	45.8	3.9	2.3	1.6
PCB	*	*	141	12.3072	0.19816	12.1

Flat Panel Display Module CCFL	-	-	-	-	-	-
Flat Panel Display Module LED	-	-	-	-	-	-
CRT Glass	10-11	7.4-9	2.3	0.7-0.8	0.44-0.54	0.26
CRT Lead	27	7.5	19.5	2	0.45	1.55
Battery	-	-	-	-	-	-
Other	-	-	-	-	-	-

Table S5. Data used for the calculation of energy and GHG savings of “other metals” as identified in Table S1. As stated in the main text, the assumption was made that “other metals” was equal parts Zn, Ni, and Sn, as the nonferrous metals that hadn’t been already called out separately. All data used comes from Ashby’s “Materials and the Environment Eco-Informed Material Choice” [7]. .

	Energy Primary (MJ/kg)	Energy Secondary (MJ/Kg)	GHG Primary (kg/kg)	GHG Secondary (kg/kg)
Zinc	57-63	10-12	3.9-4.3	0.62-0.72
Nickel	20.64	1.86	2.12	0.22
Tin	18.2	0.2	2.18	0.024
Average (used for "other metals")	39.71	6.015	3.125	0.396

Table S6. Data used for the calculation of GHG savings for PCBs. Due to the lack of data we estimate the GHG differential between primary and secondary production of PCBs based on the primary and secondary GHG emissions from the quantities of four materials (gold, silver, copper, and zinc) used in PCBs. The mass of these metals per mass of PCBs comes from Wang and Gaustad [8], while the energy and GHG values are from Ashby’s “Materials and the Environment Eco-Informed Material Choice” [7].

	kg Metal/kg PCB	Primary Production (MJ/kg Metal)	Secondary Production (MJ/kg Metal)	Delta Average (MJ/kg Metal)	GHG Primary (kg/kg Metal)	GHG Secondary (kg/kg Metal)	GHG Delta (kg/kg Metal)	GHG Delta (kg/kg PCB)
Gold	0.00043	240,000-265,000	650-719	251815.5	25000-28000	41-45	26457	11.4
Silver	0.0016	1,400-1,550	140-170	1320	95-105	8.4-10.2	90.7	0.15
Copper	0.19	55-62	12 to 15	45	3.5-3.9	0.75-0.9	2.875	0.55
Zinc	0.012	57-63	10 to 12	49	3.9-4.3	0.62-0.72	3.43	0.04

References:

- 1 Babbitt, C.; Althaf, S.; Chen, R.; Sustainable Materials Management for the Evolving Consumer Technology Ecosystem. 2017. Available Online: <https://www.rit.edu/gis/ssil/docs/Sustainable%20Materials%20Management%20for%20the%20Evolving%20Consumer%20Technology%20Ecosystem.pdf> (accessed 3 July 2018).
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