Science Advances

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Supplementary Materials for

Production, use, and fate of all plastics ever made

Roland Geyer, Jenna R. Jambeck, Kara Lavender Law

Published 19 July 2017, *Sci. Adv.* **3**, e1700782 (2017)
DOI: 10.1126/sciadv.1700782

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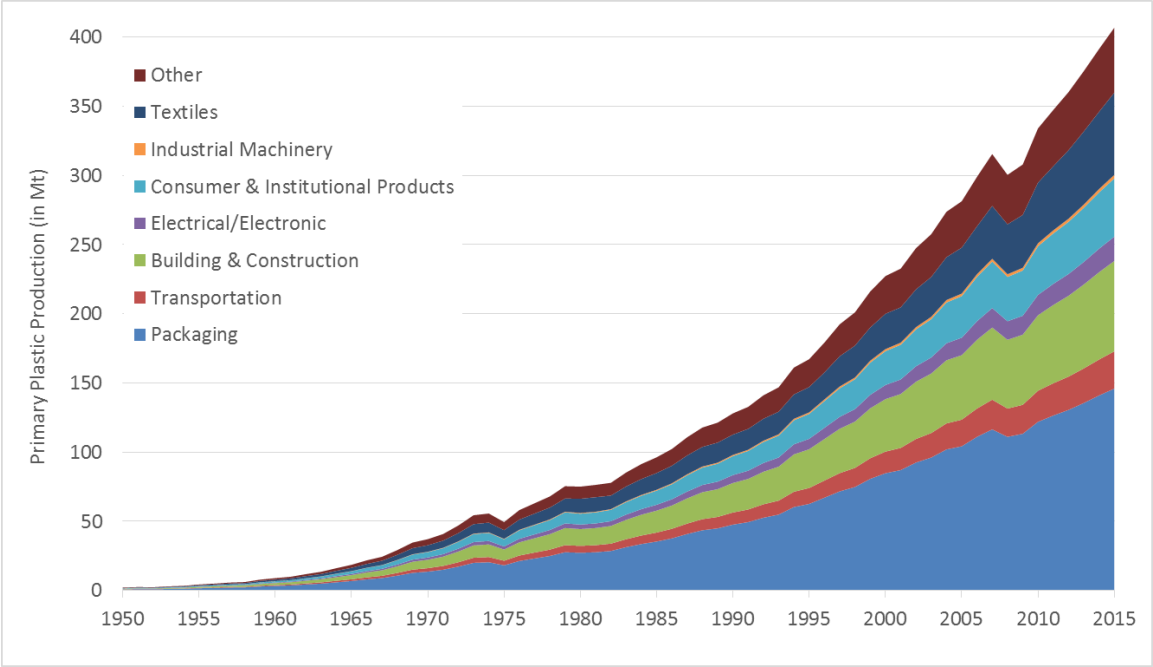

fig. S1. Global primary plastics production (in million metric tons) according to industrial use sector from 1950 to 2015.

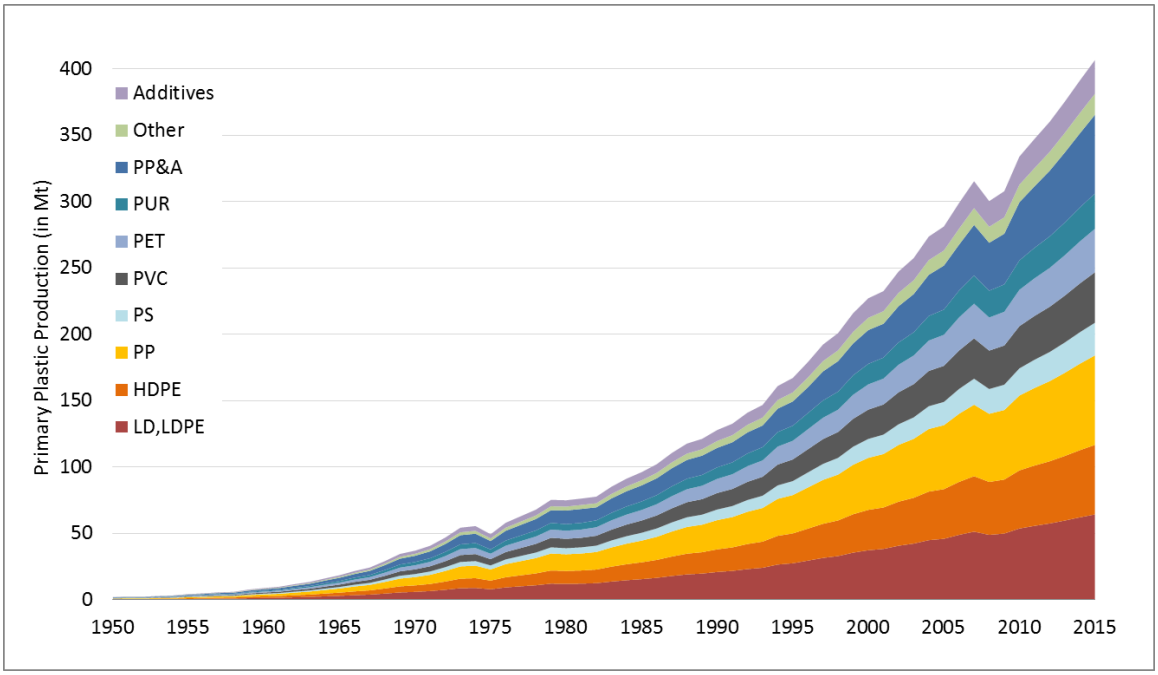

fig. S2. Global primary plastics production (in million metric tons) according to polymer type from 1950 to 2015.

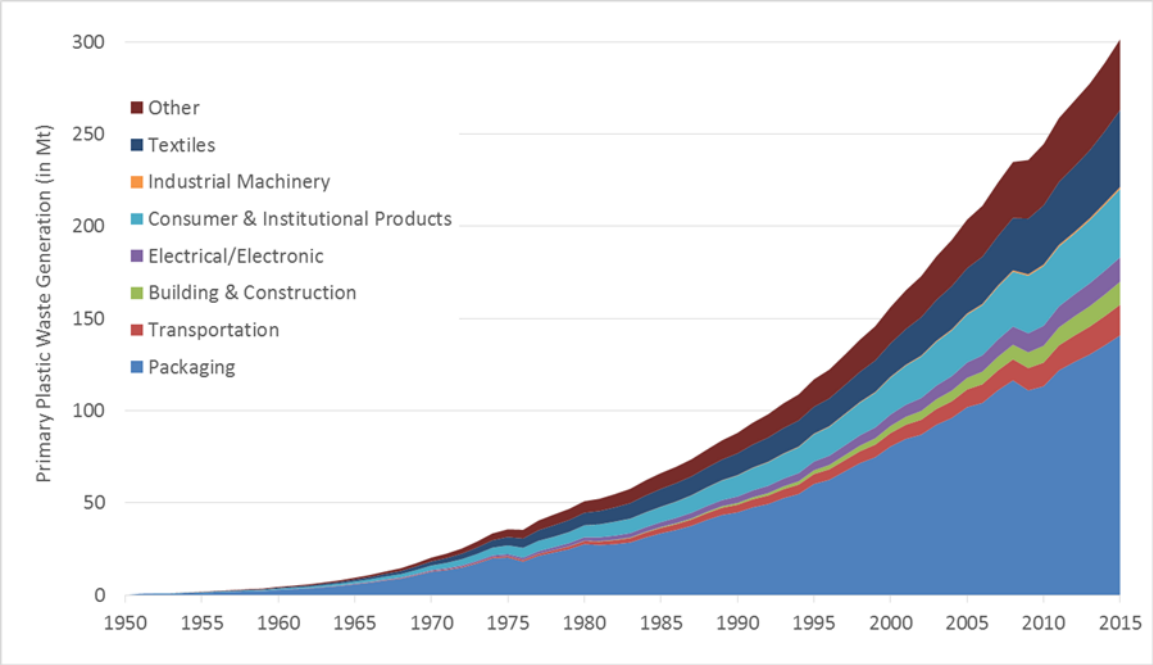

fig. S3. Global primary plastics waste generation (in million metric tons) according to industrial use sector from 1950 to 2015.

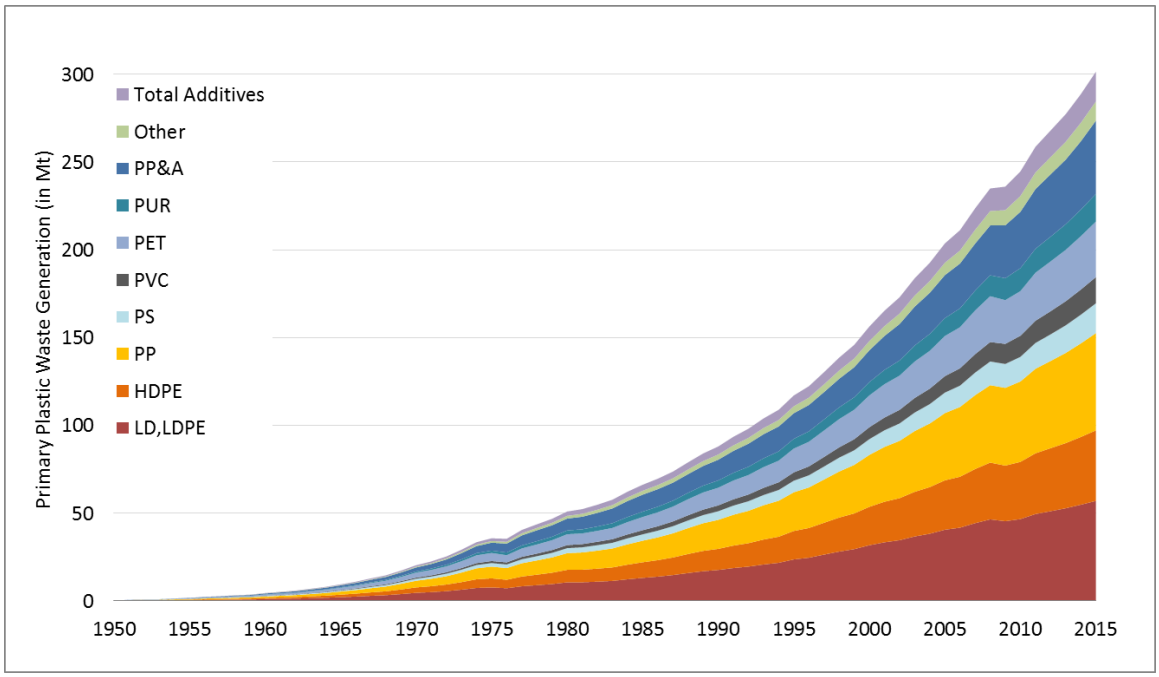

fig. S4. Global primary plastics waste generation (in million metric tons) according to polymer type from 1950 to 2015.

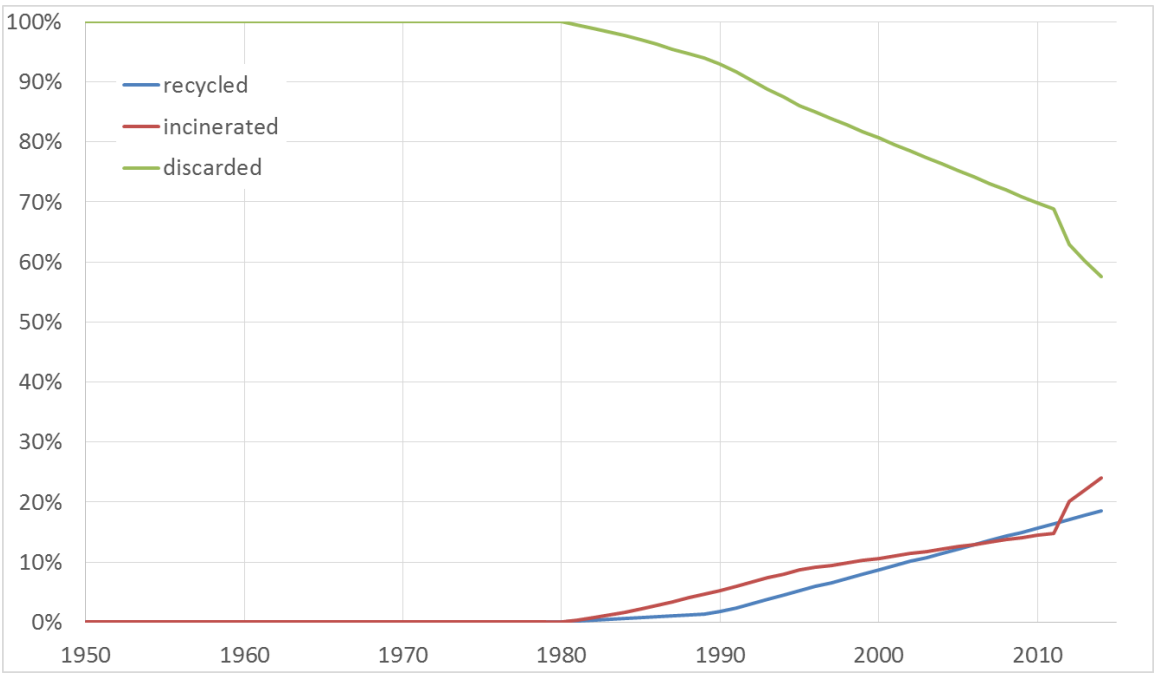

fig. S5. Estimated percentage of global (nonfiber) plastic waste recycled, incinerated, and discarded from 1950 to 2014 [(*12*, *13*, *34*–*42*) and table S7].

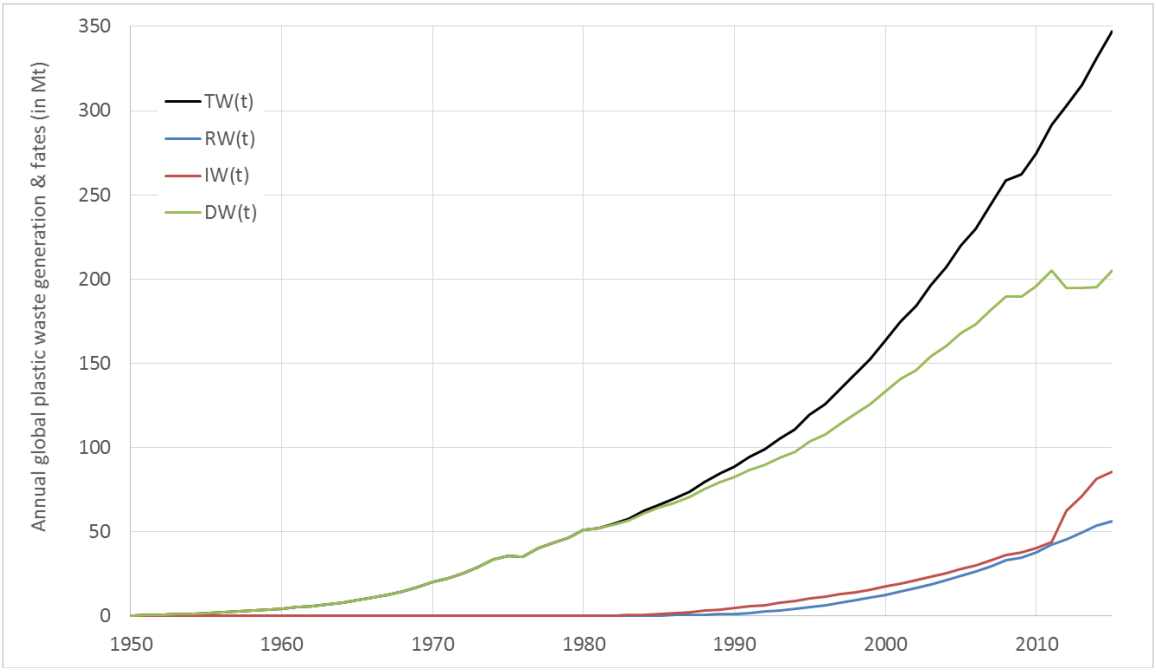

fig. S6. Annual global primary and secondary plastic waste generation TW (*t*), recycling RW (*t*), incineration IW (*t*), and discard DW (*t*) (in million metric tons) from 1950 to 2014.

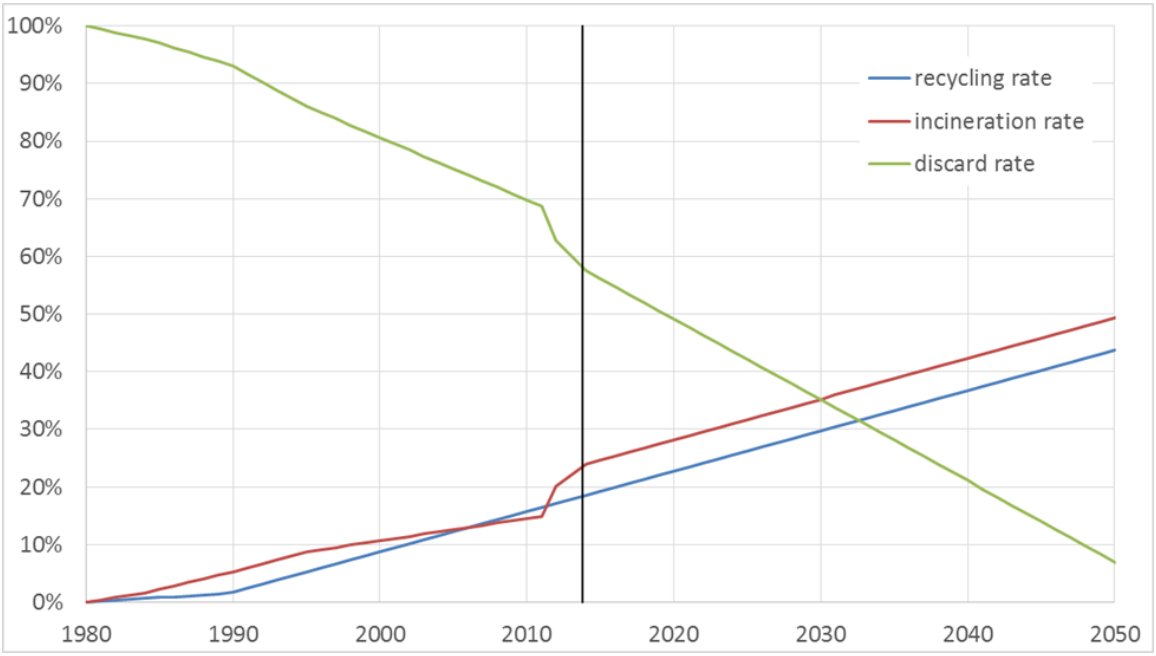

fig. S7. Projection of global trends in recycling, incineration, and discard of plastic waste from 1980 to 2014 (to the left of vertical black line) to 2050 (to the right of vertical black line).

table S1. Annual global polymer resin and fiber production in million metric tons (*12–15*).

Year	Global Production (Mt)
	Resin
2015	381
2014	367
2013	352
2012	338
2011	325
2010	313
2009	288
2008	281
2007	295
2006	280
2005	263
2004	256
2003	241
2002	231
2001	218
2000	213
1999	202
1998	188
1997	180
1996	168
1995	156
1994	151
1993	137
1992	132
1991	124
1990	120
1989	114
1988	110
1987	104
1986	96
1985	90
1984	86
1983	80
1982	73
1981	72
1980	70
1979	71
1978	64
1977	59
1976	54
1975	46

1974	52
1973	51
1972	44
1971	38
1970	35
1969	32
1968	27
1967	23
1966	20
1965	17
1964	15
1963	13
1962	11
1961	9
1960	8
1959	7
1958	6
1957	5
1956	5
1955	4
1954	3
1953	3
1952	2
1951	2
1950	2

table S2. Share of total polymer resin production according to polymer type and industrial use sector calculated from data for Europe, the United States, China, and India covering the period 2002–2014 (*12*, *13*, *19*–*24*). Note that PP&A fibers are assigned exclusively to the Textile sector. The above table is for non-fibers only.

Market Sector	LDPE, LLDPE	HDPE	PP	PS	PVC	PET	PUR	Other	Total
Transportation	0.1%	0.8%	2.6%	0.0%	0.3%	0.0%	1.6%	1.4%	6.7%
Packaging	13.5%	9.3%	8.2%	2.3%	0.9%	10.1%	0.2%	0.1%	44.8%
Building and Construction	1.1%	3.3%	1.2%	2.2%	8.1%	0.0%	2.4%	0.5%	18.8%
Electrical /Electronic	0.5%	0.2%	0.9%	0.6%	0.4%	0.0%	0.4%	1.0%	3.8%
Consumer & Institutional Products	2.9%	1.7%	3.8%	1.8%	0.6%	0.0%	1.0%	0.2%	11.9%
Industrial Machinery	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%	0.3%	0.0%	0.8%
Other	1.7%	0.9%	4.2%	0.7%	1.4%	0.0%	2.5%	1.7%	13.2%
Total	20.0%	16.3%	21.0%	7.6%	11.8%	10.2%	8.2%	4.9%	100.0%

table S3. Share of additive type in global plastics production from data covering the period 2000–2014 (*17*, *18*).

Additive type	Percentage
Plasticizers	34%
Flame retardants	13%
Heat stabilizers	5%
Fillers	28%
Impact modifiers	5%
Antioxidants	6%
Colorants	2%
Lubricants	2%
Light stabilizers	1%
Other	4%

table S4. Baseline mean values and SDs used to generate log-normal product lifetime distributions for the eight industrial use sectors used in this study (*22*, *25*–*29*).

Market Sector	Mean (in years)	Standard deviation
Packaging	0.5	0.1
Transportation	13	3
Building and Construction	35	7
Electrical/ Electronic	8	2
Consumer & Institutional Products	3	1
Industrial Machinery	20	3
Other	5	1.5
Textiles	5	1.5

table S5. Global primary plastics production and primary waste generation (in million metric tons) in 2015 according to industrial use sector.

Market Sector	2015 Primary Production (Mt)	2015 Primary Waste Generation (Mt)
Packaging	146	141
Transportation	27	17
Building and Construction	65	13
Electrical/ Electronic	18	13
Consumer & Institutional Products	42	37
Industrial Machinery	3	1
Textiles	59	42
Other	47	38
Total	**407**	**302**

table S6. Global primary plastics production and primary waste generation (in million metric tons) in 2015 according to polymer type/additive.

Polymer type/additive	2015 Primary Production (Mt)	2015 Primary Waste Generation (Mt)
LD, LDPE	64	57
HDPE	52	40
PP	68	55
PS	25	17
PVC	38	15
PET	33	32
PUR	27	16
PP&A fibers	59	42
Other	16	11
Additives	25	17
Total	**407**	**302**

table S7. Additional data sources for U.S. plastics recycling and incineration.

U.S. EPA. Characterization of Municipal Solid Waste in the United States:
1995 Update. EPA/530-R-945-001. March 1996
1996 Update. EPA/530-R-97-015. June 1997.
1997 Update. EPA/530-R-98-007. May 1998.
1998 Update. EPA/530-R-99-021. September 1999.
U.S. EPA. Municipal Solid Waste Generation, Recycling and Disposal in the United States:
Facts and Figures for 1998. EPA/530-F-00-024. April 2000.
1999 Facts and Figures. EPA/530-R-01-014. July 2001
2000 Facts and Figures. EPA/530-R-02-001. June 2002.
2001 Facts and Figures. EPA/530-R-03-011. October 2003.
2005 Facts and Figures. EPA530-R-06-011. October 2006.
2007 Facts and Figures. EPA530-R-08-010. November 2008.
2009 Facts and Figures. December 2010. EPA530-R-10-012.
Facts and Figures for 2012, February 2014. EPA-530-F-14-001.
U.S. EPA. Advancing Sustainable Materials Management:
2013 Fact Sheet, June 2015. EPA530-R-15-003.
2014 Fact Sheet, November 2016. EPA530-R-17-01.

table S8. Complete list of data sources.

Data	Reference
Global resin production	(*12, 13*)
Global fiber production	(*14, 15*)
Global additives production	(*17, 18*)
Sector and polymer shares of resin	(*12, 13, 19–24*)
Sector and polymer shares of additives	(*17, 18*)
Product lifetime data	(*22, 25–29*)
European waste management data	(*12, 13, 38*)
U.S. waste management data	(*34, 42, and table S7)*
Chinese waste management data	(*35, 36, 39, 40*)
Rest of world waste management data	(*37*)