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Tobacco industry accountability for marine pollution: country and global estimates

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ABSTRACT

Background Commercial cigarette filters are single-use plastics and the main component of cigarette butts, the most common trash item collected worldwide.

Governments bear the economic burden of managing the waste and the environmental pollution due to discarded filters and packages. Using available data sources, we estimate the economic burden of plastic tobacco waste on country economic groups.

Methods We reviewed available public data sources that could inform estimates of the economic environmental burden of butt waste for countries. We estimated total weight of plastic cigarette filters and packaging based on cigarette consumption and applied World Bank waste management cost estimates per ton to this total. We then applied estimates of ecosystem losses per ton of plastic waste provided by the World Wildlife Fund to establish losses attributable to tobacco's plastics.

Results We estimate that US\$25.7 billion is lost annually (waste management and marine ecosystem service losses) due to cigarette plastic sources. We estimate US\$186 billion in such losses over a 10-year period, adjusted for inflation. Countries are making progress in developing plastics policies, particularly banning single-use ones, but the costs of tobacco's plastic pollution are overlooked.

Conclusion Efforts to reduce plastic pollution should address cigarette filters as toxic, widespread and preventable sources of marine pollution. Countries may develop specific estimates of waste management and ecosystem costs in order to assign tobacco industry accountability for this pollution. These results indicate minimum estimates for a majority of countries.

INTRODUCTION

Cigarette butts (or filters) are the most littered item on the planet, and numerous studies have demonstrated how they adversely affect aquatic and terrestrial life. These reports describe impacts on microorganisms, fish, amphibians, invertebrates, crustaceans and other life forms.¹ Decades ago, cigarette filters were introduced under the guise of addressing health concerns related to smoking. However, the cellulose acetate filter, attached to nearly all commercial cigarettes, is a deceptive design element that makes cigarette smoking more appealing, especially to adolescents and young adults, by providing a false impression of safety.² In actuality, cigarette filters have failed to mitigate the health risks associated with tobacco use for the general public.³ The article “Cigarette with Defective Filters Marketed for Over 40 Years: What Philip Morris Never Told Smokers” pointed out that the

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The economic burden of tobacco's toxic waste on a global scale is still a largely underexplored area, with most studies focusing on either a single kind of waste product (eg, cigarette filters) or a particular geographical location. The lack of waste management data specific to tobacco waste is a major limitation of such studies.

WHAT THIS STUDY ADDS

⇒ This study highlights the concerns around tobacco's toxic products as sources of single-use plastics, which are significant environmental contaminants, calculated for 194 countries, a first of its kind.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The results of this study offer a practical and potentially useful method to estimate the economic burdens of tobacco plastics to countries according to their economic status, which can be further compensated by tobacco companies in the form of ecotaxes or penalties.

cellulose acetate fibers comprising the filter have been shown to deposit into the lungs of smokers.

In response to increasing public awareness about the environmental impacts of tobacco product waste, the tobacco industry (TI) has made attempts to ‘greenwash’ its activities. For example, the industry has engaged with anti-littering campaigns and coastal clean-up events to address these concerns through governmental and non-governmental activities.^{4–7} These include collection and recycling schemes,^{8–10} ashtray giveaways¹¹ and water stewardship initiatives.^{12–14} Although these efforts try to put the TI in a good light, such downstream-focused remedies do not result in significant changes in the volume of tobacco product waste.¹⁵ Currently, around 70 countries ban all forms of such TI sponsorship (better known as so-called corporate social responsibility) under obligations of the WHO's Framework Convention on Tobacco Control (FCTC).¹⁶

Governments bear the main burden of the direct and secondary environmental costs (externalities) of tobacco product waste, especially plastic cigarette filters.¹⁷ Thus, tobacco control and environmental agencies could benefit from estimates of the environmental costs due to tobacco plastics. There have been a handful of efforts to quantify these costs and assign responsibility for them to the industry



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Table 1 Governmental efforts to hold tobacco industry accountable for tobacco product waste costs

Country	Cost amount/year
France	Government estimated €80 million annual cost of reducing environmental pollution caused by cigarette butts. ³³
UK	Government estimated £40 million annual cost of cleaning up discarded cigarette butts. ³⁴
San Francisco, California (USA)	Tobacco product waste clean-up cost in San Francisco alone is approximately US\$7.4 million annually. ³⁵
European Union	No specific cost estimate is available for tobacco product waste, but 'Single-Use Plastics Directive' is estimated to reduce the environmental damage of these plastics by €22 billion. ³⁶

(table 1). In most cases, the research has involved observational studies and municipal/national level estimates of clean-up costs. Data for these types of studies are lacking for the majority of countries. We describe an economic estimation process involving currently available data that can provide a minimum quantification of the environmental costs attributable to tobacco product plastics.

METHODS

We first reviewed existing sources and literature on tobacco's environmental economic costs through a keyword search for 'cost', 'valuation', 'estimate', 'cigarette butts', 'cigarette filters', 'plastic pollution', 'waste', 'current' and 'projected'. We found that there were estimates available from the World Bank's publication, *What a Waste 2.0*, for waste management costs per volume collected in each country as well as efficiency costs (1-estimated percentage of waste not collected).¹⁸ 'Benchmark' costs for total plastic waste are available from the Organisation for Economic Co-operation and Development (OECD) report on plastics.¹⁹

Data on cigarette sales (consumption) are published periodically in the *Tobacco Atlas* at the country level.²⁰ Not all cigarettes sold have filters; therefore, we used a schedule of 49 countries that lists a specific percentage of cigarettes that have filters and then assumed that 98% of cigarettes sold in the remainder of the countries are filtered.²¹ The average weight of each plastic filter is 3.4 g.²²

Because cigarette butts are often littered along with plastic packaging, we included the weight of plastic packaging in the estimation procedure, which includes the outer plastic film as well as the inner sleeve. The weight of the package and sleeve is computed based on the standard size of a pack of 20 cigarettes (19 g).²³

World Wildlife Fund (WWF) provided a range of economic estimates for marine ecosystem losses (MEL) that can result from a ton of plastic waste (US\$204 270–US\$408 541).²⁴ We used the median (US\$306 405.5) of this range to apply conservatively to all country estimates per ton of tobacco plastic waste.

Finally, we developed a formula to estimate the single-year and 10-year projections of the environmental economic costs of tobacco plastic based on the tonnage of cigarette filters and plastic packaging. We multiplied this quantity by MEL per ton and by the waste management costs per ton for countries according to World Bank economic grouping. This total reflects cost estimates of clean-up and disposal of the total plastic generated by filtered cigarette sales, and not the clean-up costs that might be estimated for tobacco waste that remains deposited in the environment. This estimate represents the potential costs of tobacco plastics that will end up as waste, either in our oceans, landfills or in the environment. Costs were adjusted for inflation

for a 10-year period, which has been reported as the survival time for cigarette filters under varying environmental conditions.²⁵

RESULTS

The general formula used for estimating the environmental economic costs of cigarette plastic pollution is:

$$\text{Environmental Economic Cost of Cigarette Plastics (US\$/year)} = (\text{EPW} \times \text{TWMC/year}) + (\text{EPW} \times \text{MEL/year})$$

where Estimated Plastic Waste (EPW) in tons=weight of filters+plastic packaging (from number of cigarettes consumed×filter weight in grams/stick+weight of plastic packaging for number of packs of 20 cigarettes×plastic required per pack and sleeves [metre of film]×plastic density [grams/metre]) and where *current* Tobacco Waste Management Costs (TWMC)/year=EPW (in tons)×Collection Efficiency (in %)×Waste Management Costs (WMC)/year (as reported by the World Bank), and where Marine Ecosystem Losses (MEL) are estimated, over a 10-year period.

$$\text{Ten – year projected TWMC/year} =$$

$$\text{EPW (intons)} \times \text{Uncollected Waste (in\%)} \times$$

$$\text{Benchmark plastic waste cost/year (according to OECD estimates).}$$

$$\text{*Uncollected Waste} = 1 - \text{Collection Efficiency in \%}$$

Therefore,

$$\text{MEL per year (over a ten10 – year lifetime)} =$$

$$\text{EPW (in tons)} \times \text{Leakage Rate} \times \text{median MEL per year}$$

***Leakage Rate:** Leakage rate of plastics into the environment=the small percentage (1–14% depending on country) of plastic waste that is presumed to leak into the oceans.

Based on this methodology, around US\$26 billion is the annual economic cost of potential cigarette product plastic waste, including US\$20.7 billion in ecosystem losses and US\$5 billion in waste management costs (as shown in table 2). Although this may appear to be a relatively small amount in comparison to the annual economic losses caused by tobacco, which total US\$1.4 trillion per year, it is still a significant cost in terms of cigarette plastic waste management, especially considering that it only pertains to one kind of tobacco product. Countries with the highest number of cigarette butts are mostly low and middle-income countries. These are the same countries where the 'leakage' rate for plastics into the environment is likely higher.²⁶ Hence, costs are highest in countries such as China, Indonesia, Japan, Bangladesh and the Philippines (tables 2 and 3).

**Plastic leakage is the potential amount of macroplastics and microplastics that are not kept in a circular loop or properly managed at their end of life, and thus leak into the environment.*

DISCUSSION

Annual costs of plastic waste due to commercial filtered cigarettes are substantial (approximately US\$26 billion). Ecosystem losses are significantly higher than waste management costs since these account for long-term impact.

The estimate for ecosystem losses is arguably conservative since it is the median, not the upper estimate, of the MEL figure provided by WWF that was used. Further, the data used to estimate TWMC are averages for collecting and processing general waste. Cigarette butts typically require special clean-up, handling and management processes due to their small size, toxicity and ubiquity.

Over 10 years, the loss of ecosystem value would be around US\$186 billion, accounting for inflation. Although this amount is small compared with the annual economic losses from tobacco

Table 2 Waste management costs by country income classification

Income class	Butts (in millions of tons)	Package plastic (in millions of tons)	World Bank data range per ton (70–328US\$) ¹⁸	Waste management cost: current (US\$ '000)	OECD data range per ton (274–406 US\$) ¹⁹	Waste management cost: additional (US\$ '000)	Total waste management cost (US\$ '000)
High income	198,670	368,474	328	183,039	274.91	2,266	184,835
Upper middle income	419,869	952,317	140	184,805	274.91	31,615	216,421
Low middle income	158,328	333,988	110	33,407	506.18	95,471	128,878
Low income	20,984	37,793	70	1,964	506.18	15,544	17,508
Total	797,851	1,692,572	–	403,217	–	144 897	547 644

OECD, Organisation for Economic Co-operation and Development.

(US\$1.4 trillion per year)²² and may appear insignificant compared with the 8 million deaths attributable to tobacco each year, these environmental costs should not be downplayed as these are accumulating and are preventable.

Limitations

Our TWMC estimation method does not account for the toxic properties of cigarette butts that makes them more harmful than only plastic waste. As mentioned, the cost of picking up tobacco product waste is likely to be significantly higher than total waste management costs in high-income countries. Cigarette butts are small and widely littered, and so they are harder to collect.¹⁵ Finally, it is difficult to estimate the accrual of tobacco pollutants over the years. These would include persistent toxic chemicals, metals and microplastics.¹ Cigarette filters have been polluting our oceans and land for at least five decades, and these trash items may have a carrier effect with the toxic chemicals leached from them. Human and ecosystem impacts of this toxic chemical accumulation are unknown.

A localised, observational research approach would be required to make a more accurate estimate of tobacco's environmental costs. However, few countries have undertaken such studies, despite the growing evidence for the environmental harms of tobacco growing, manufacturing, use and disposal.²²

The general estimates provided here could provide fiscal evidence of the need to mitigate tobacco plastic waste pollution. Optimal costing studies involve collecting data at the country level, which may not be feasible or practical in many developing nations due to lack of funding, data or capacity. Where such data or research are not available, cost estimates derived from public sources as the World Bank, WHO and OECD can provide useful preliminary information.

CONCLUSION AND RECOMMENDATIONS

Numerous nations around the world have united in their efforts to combat the issue of plastic pollution, including through a new treaty negotiation process that began in March 2022 and will conclude by December 2024.²⁷ Cigarette butts, being one of the most littered items in the world, should be specifically addressed by a global plastic waste policy. Initial planning discussions on the plastics treaty suggest

Table 3 Marine pollution and waste management costs by income classification (in million US\$)

Income class	Waste management cost (US\$,000)	Loss of ecosystem service lifetime (marine pollution) (US\$,000)	Total (US\$,000,000)
High income	184,835	5,233,430	5,418
Upper middle income	216,421	6,098,970	6,315
Low middle income	128,878	8,460,670	8,589
Low income	17,508	620,881	638
Global	547,644	20,413,960	21,253

that plastic producers will be expected to bear some or all of the costs of prevention and mitigation of plastic pollution. So far, these costs are imposed on industries in only high-income countries, and they include only waste management and litter abatement (see online supplemental tables). To prepare for more specific economic policy discussions, governments need valid estimates of waste management costs and ecosystem losses. These data will assist in assigning industry responsibility for these losses, including that of the TI. The estimates herein represent a minimum estimate for a majority of countries; and for tobacco products, there will be additional costs of handling the toxic chemicals accompanying the plastic waste from cigarettes.

Shifting costs of tobacco product waste upstream to tobacco companies is crucial but is only a stopgap measure in terms of the tobacco end game, which is to accomplish a tobacco-free future.^{28 29} According to many advocates, the better solution is to ban the sale of plastic cigarette filters as part of the global effort to eliminate single-use plastics.² Cigarette butts are unlike any other single-use plastic waste product; filters have no beneficial use and are a marketing feature that only makes smoking more palatable. The TI knew filters were a design flaw in that their use has been linked to a specific type of aggressive lung cancer, in addition to other cancer and cardiovascular risks caused by smoking tobacco.³⁰ It bears stressing that because the TI continues to market the most hazardous consumer product in the world, along with such a toxic product feature, and because of its history of human rights violations,³¹ it should be excluded from any intergovernmental engagements such as the plastics treaty. This rogue industry is not a 'stakeholder' in efforts to improve human health or environmental safety. The tobacco companies have significant control over the product design and supply chains of their products, and the entire life cycle of tobacco production and use causes harms to the environment.²² They have chosen to obscure and aggravate these harms through new products (eg, electronic cigarettes) that create additional sources of environmental pollution.³²

Cost estimates must also include accrued harms. This approach aligns with environmental principles such as 'Polluter Pays Principle', the application of which would be consistent with the governments' duty to deal with tobacco industry liability under the tobacco control treaty. (Article 19 of the WHO FCTC, Liability). This principle can also be linked with price and tax measures (Article 6 of the WHO FCTC) by incorporating the costs of harms into such measures. The cost can be a fee or added tax per pack of cigarettes, which also could deter smoking. Notably, a few countries have imposed surcharges and fees consistent with the 'polluter pays' principle. Policies that make the TI pay for clean-up costs are under consideration in France, the UK, the European Union and the USA (refer to table 1).

The environmental and economic costs of commercial cigarette production estimated here may not account for the full impact of waste from tobacco products, which is probably higher. However, these estimates can be a useful starting point for discussions on assigning accountability to the TI for these

costs. However, further studies must take into account the toxic nature of cigarette butt waste and its actual impact on marine, terrestrial and human life. These costs likely will accumulate, just as do the toxic plastic wastes produced by commercial cigarettes.

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Supplementary Tables

Table 1: Results

The following table presents results calculated for 194 countries using the formula presented in this study.

	Country	Cigarette Consumption (in million tons)	Collection Efficiency Assigned (%) ^[1]	Waste Management (USD) ^[1,2]	Loss of Ecosystem Services Lifetime (Marine Pollution) (USD) ^[3]	Total Costs (USD)
1	Afghanistan	5,894	43	876,272	5,345,715	6,221,986
2	Albania	5,902	60	545,739	5,353,061	5,898,800
3	Algeria	30,062	68	3,321,218	109,058,709	112,379,927
4	Andorra	434	100	66,274	393,349	459,623
5	Angola	4,611	23.1	892,104	16,727,250	17,619,354
6	Antigua and Barbuda	6	98.61	961	28,569	29,530
7	Argentina	38,648	89.91	2,883,616	175,261,005	178,144,620
8	Armenia	4,894	85	379,494	4,438,664	4,818,158
9	Australia	18,096	98	2,726,238	32,258,789	34,985,027
10	Austria	18,096	97.77	2,765,383	49,519,293	52,284,676
11	Azerbaijan	11,662	56	1,106,181	10,577,243	11,683,424
12	Bahamas	136	98	20,777	618,547	639,323
13	Bahrain	1,210	98	184,293	15,362,637	15,546,930
14	Bangladesh	86,149	52	11,538,288	1,018,482,432	1,030,020,720
15	Barbados	64	90	9,608	289,774	299,382

16	Belarus	23,303	93.2	1,692,940	21,134,986	22,827,926
17	Belgium	23,052	97.74	3,477,843	61,820,911	65,298,754
18	Belize	42	85.2	3,313	190,915	194,228
19	Benin	1,324	68	146,254	4,802,536	4,948,790
20	Bhutan	927	68	102,415	11,770,531	11,872,946
21	Bolivia	2,158	57.6	279,892	9,785,648	10,065,540
22	Bosnia and Herzegovina	5,822	73.99	489,686	5,280,051	5,769,737
23	Botswana	680	85	52,721	2,466,569	2,519,291
24	Brazil	70,700	90.81	5,256,193	322,451,803	327,707,996
25	Brunei Darussalam	3	98	487	40,632	41,119
26	Bulgaria	11,073	98.3	756,112	9,742,581	10,498,693
27	Burkina Faso	4,156	34.52	688,274	15,032,564	15,720,838
28	Burundi	1,521	43	226,126	5,517,946	5,744,072
29	Cabo Verde	148	70.6	15,629	536,558	552,187
30	Cambodia	7,885	68	871,105	100,115,536	100,986,641
31	Cameroon	2,360	61.6	288,594	8,559,891	8,848,485
32	Canada	31,403	99	4,790,958	85,442,461	90,233,418
33	Central African Republic	652	43	96,888	2,364,264	2,461,152

34	Chad	2,124	43	315,729	7,704,446	8,020,175
35	Chile	11,177	95	1,700,449	50,977,030	52,677,480
36	China	2,350,500	94	153,568,981	3,626,958,059	3,780,527,041
37	Colombia	6,640	80.6	507,302	27,880,216	28,387,519
38	Comoros	283	68	31,266	1,026,679	1,057,945
39	Congo (Democratic Republic of the)	5,525	43	821,353	20,042,734	20,864,087
40	Congo (Republic of the)	531	68	58,709	1,927,835	1,986,544
41	Cook Islands	13	85	1,029	168,513	169,542
42	Costa Rica	1,560	90.4	115,917	7,072,930	7,188,846
43	Côte d'Ivoire	4,730	68	522,572	17,159,688	17,682,261
44	Croatia	5,685	97.76	865,593	5,155,978	6,021,572
45	Cuba	2,233	76.9	150,780	7,247,750	7,398,530
46	Cyprus	1,509	92.42	227,771	1,368,512	1,596,283
47	Czech Republic	21,855	100	3,303,192	77,920,383	81,223,575
48	Denmark	6,193	100	896,410	15,447,911	16,344,321
49	Djibouti	477	68	52,710	1,730,843	1,783,553
50	Dominica	8	94	599	37,639	38,238
51	Dominican Republic	1,640	85	127,193	7,438,435	7,565,628

52	Ecuador	1,092	85	84,677	4,952,003	5,036,680
53	Egypt	90,009	68	9,730,462	315,473,205	325,203,666
54	El Salvador	935	78.8	84,587	4,237,772	4,322,359
55	Equatorial Guinea	174	85	13,461	629,793	643,255
56	Eritrea	407	85	31,568	1,476,894	1,508,462
57	Estonia	1,951	86.89	291,904	5,309,255	5,601,159
58	Eswatini	0.0057013	68	1	21	21
59	Ethiopia	6,942	50	933,163	25,184,473	26,117,636
60	Fiji	315	85	24,395	3,994,616	4,019,011
61	Finland	5,070	100	774,678	13,793,505	14,568,183
62	France	57,743	100	8,466,962	147,096,198	155,563,160
63	Gabon	501	23.6	57,231	1,818,274	1,875,505
64	Gambia	276	43	40,973	999,833	1,040,806
65	Georgia	6,287	60	581,273	5,701,606	6,282,879
66	Germany	114,437	97.55	17,272,500	307,255,882	324,528,382
67	Ghana	696	68	76,850	2,523,526	2,600,376
68	Greece	19,384	98	2,948,237	52,619,577	55,567,814
69	Grenada	13	85	969	56,685	57,654
70	Guatemala	1,189	77.7	97,403	5,393,239	5,490,643

71	Guinea	2,357	43	350,473	8,552,273	8,902,746
72	Guinea-Bissau	28	43	4,207	102,668	106,875
73	Guyana	199	89	14,941	901,519	916,459
74	Haiti	1,034	68	114,270	4,690,345	4,804,615
75	Honduras	2,654	64.6	309,884	12,034,909	12,344,794
76	Hungary	17,465	99.94	2,652,963	47,082,164	49,735,127
77	Iceland	225	100	34,352	611,654	646,006
78	India	84,861	68	8,231,212	248,631,121	256,862,333
79	Indonesia	316,394	45	43,292,863	3,348,278,461	3,391,571,324
80	Iran (Islamic Republic of)	57,240	100	2,757,112	187,514,134	190,271,246
81	Iraq	26,295	76	2,046,052	86,139,879	88,185,931
82	Ireland	3,539	92.04	533,933	9,630,014	10,163,946
83	Israel	7,566	98	1,152,428	27,447,520	28,599,949
84	Italy	78,064	88.92	11,546,069	207,523,051	219,069,121
85	Jamaica	674	76	55,843	3,054,189	3,110,032
86	Japan	173,999	99.9	26,681,622	1,745,880,761	1,772,562,383
87	Jordan	11,565	85	896,798	41,956,708	42,853,506
88	Kazakhstan	23,379	77	1,924,467	21,203,462	23,127,929
89	Kenya	7,287	40	1,182,312	26,437,529	27,619,841

90	Kiribati	104	54	14,195	1,321,804	1,335,999
91	Korea (Democratic People's Republic of)	19,840	43	2,949,540	251,912,208	254,861,748
92	Korea (Republic of)	72,628	99.9	11,096,642	724,579,819	735,676,461
93	Kuwait	4,384	100	669,941	15,904,818	16,574,759
94	Kyrgyzstan	2,135	68	235,909	1,936,632	2,172,541
95	Lao PDR	5,064	55	681,142	64,297,415	64,978,558
96	Latvia	1,992	84.36	296,786	5,420,539	5,717,324
97	Lebanon	9,330	85	723,435	33,845,944	34,569,379
98	Lesotho	620	20	123,432	2,247,810	2,371,242
99	Liberia	413	43	61,445	1,499,387	1,560,832
100	Libya	1,458	85	113,088	5,290,843	5,403,932
101	Lithuania	3,210	98.69	489,447	8,733,211	9,222,659
102	Luxembourg	3,079	100	3,079	8,376,776	8,379,855
103	Madagascar	5,897	17.7	1,180,385	21,394,105	22,574,490
104	Malawi	2,357	43	350,458	8,551,910	8,902,368
105	Malaysia	10,283	95	727,122	128,088,220	128,815,342
106	Maldives	151	38.2	15,874	1,910,965	1,926,839

107	Mali	3,021	43	449,071	10,958,257	11,407,327
108	Malta	550	96.65	83,625	499,010	582,634
109	Marshall Islands	3	49	253	32,445	32,698
110	Mauritania	76	68	8,385	275,353	283,739
111	Mauritius	562	83.7315068	44,036	2,040,298	2,084,334
112	Mexico	30,632	93.4	2,091,423	126,067,197	128,158,620
113	Micronesia (Federated States of)	41	8	9,139	524,130	533,269
114	Moldova (Republic of)	5,982	85	463,853	5,425,346	5,889,199
115	Mongolia	4,256	68	470,194	54,039,052	54,509,245
116	Montenegro	562	96.99	39,578	509,984	549,562
117	Morocco	17,302	68	1,612,015	47,266,166	48,878,181
118	Mozambique	7,916	52.5	1,023,788	28,717,265	29,741,053
119	Myanmar	8,989	60	1,126,031	114,136,054	115,262,084
120	Namibia	476	85	36,887	1,725,764	1,762,651
121	Nauru	21	100	3,270	271,679	274,949
122	Nepal	10,069	62.3	1,218,463	127,844,214	129,062,677
123	The Netherlands	20,901	100	3,087,975	53,896,176	56,984,152
124	New Zealand	2,508	97	381,420	4,549,494	4,930,914

125	Nicaragua	1,421	92.3	93,167	6,444,406	6,537,574
126	Niger	1,217	43	180,975	4,416,171	4,597,146
127	Nigeria	17,029	68	1,689,464	51,844,464	53,533,927
128	Niue	1	85	74	12,184	12,259
129	North Macedonia	4,819	76.61	397,785	4,370,370	4,768,154
130	Norway	2,392	99	364,938	8,677,796	9,042,734
131	Oman	996	98	151,696	3,612,967	3,764,663
132	Pakistan	45,600	68	5,037,908	165,429,555	170,467,463
133	Palau	51	77	7,566	652,820	660,387
134	Occupied Palestinian territory	2,051	43	304,900	7,440,207	7,745,107
135	Panama	640	84.9	49,650	2,901,366	2,951,016
136	Papua New Guinea	8,306	60	1,040,510	105,467,509	106,508,018
137	Paraguay	1,817	46.6	182,578	8,241,548	8,424,126
138	Peru	2,246	82.93	176,912	10,183,804	10,360,716
139	Philippines	79,074	68	8,656,535	989,619,096	998,275,631
140	Poland	44,872	100	6,329,757	107,294,841	113,624,598
141	Portugal	10,207	100	1,554,003	27,611,447	29,165,450
142	Qatar	1,973	100	301,451	7,156,642	7,458,093

143	Romania	19,746	87.45	1,239,550	12,971,675	14,211,226
144	Russian Federation	278,472	85	21,593,495	252,563,134	274,156,629
145	Rwanda	664	43	98,672	2,407,798	2,506,470
146	Saint Kitts and Nevis	3	95	406	12,152	12,558
147	Saint Lucia	80	100	5,467	361,424	366,890
148	Saint Vincent and the Grenadines	22	85	1,675	97,952	99,627
149	Samoa	181	100	9,264	2,291,889	2,301,153
150	San Marino	140	98	21,261	126,594	147,855
151	Sao Tome and Principe	18,856	48.4	2,766,382	68,405,860	71,172,242
152	Saudi Arabia	30,912	100	4,433,028	101,265,495	105,698,523
153	Senegal	3,150	21.4	619,444	11,429,151	12,048,595
154	Serbia	14,028	74.67	1,174,215	12,722,385	13,896,601
155	Seychelles	40	98	6,139	146,202	152,341
156	Sierra Leone	1,789	43	266,029	6,491,659	6,757,688
157	Singapore	2,828	100	432,151	35,908,371	36,340,522
158	Slovakia	6,944	94.34	1,051,494	18,894,069	19,945,563
159	Slovenia	3,937	93.84	595,592	10,710,747	11,306,340
160	Solomon Islands	514	12	109,975	6,525,216	6,635,191

161	Somalia	1,175	43	174,746	4,264,164	4,438,910
162	South Africa	19,778	85	1,500,674	69,320,134	70,820,808
163	South Sudan	2,839	43	422,057	10,299,078	10,721,135
164	Spain	59,071	100	8,993,856	159,802,339	168,796,195
165	Sri Lanka	4,013	68	443,303	50,948,494	51,391,796
166	Sudan	8,371	43	1,244,526	30,369,021	31,613,546
167	Suriname	206	48.7	20,437	934,169	954,606
168	Sweden	5,860	100	888,905	15,760,410	16,649,315
169	Switzerland	10,651	99	1,632,602	38,926,804	40,559,406
170	Syrian Arab Republic	27,197	74	2,327,489	98,667,846	100,995,335
171	Tajikistan	2,035	38.25	336,726	1,845,573	2,182,300
172	Tanzania	5,500	68	607,642	19,953,126	20,560,769
173	Thailand	47,122	85	3,640,619	594,886,291	598,526,910
174	Timor-Leste	829	68	91,589	10,526,306	10,617,896
175	Togo	640	43	95,148	2,321,818	2,416,967
176	Tonga	67	71	5,772	853,268	859,041
177	Trinidad and Tobago	738	94.31	111,805	3,348,497	3,460,302
178	Tunisia	13,750	65	1,595,360	49,882,815	51,478,175

179	Turkey	105,763	88.12	7,802,960	368,484,900	376,287,861
180	Turkmenistan	3,763	85	291,755	3,412,438	3,704,193
181	Tuvalu	4	47	392	49,711	50,104
182	Uganda	4,116	37.5	657,980	14,931,831	15,589,811
183	Ukraine	71,947	75.86	6,903,369	65,253,162	72,156,531
184	United Arab Emirates	5,960	98	907,832	21,621,933	22,529,765
185	United Kingdom	44,875	97.43	6,853,922	163,732,542	170,586,464
186	United States of America	266,341	100	40,418,271	716,775,082	757,193,353
187	Uruguay	1,824	98	277,833	8,271,478	8,549,311
188	Uzbekistan	10,737	68	1,186,239	9,738,123	10,924,363
189	Vanuatu	185	12	39,526	2,345,218	2,384,744
190	Venezuela	9,014	100	618,272	40,876,700	41,494,972
191	Vietnam	76,251	72	7,860,420	968,192,796	976,053,216
192	Yemen	6,999	20	1,368,199	25,391,986	26,760,184
193	Zambia	1,320	20	262,880	4,787,299	5,050,179
194	Zimbabwe	1,147	68	126,666	4,159,320	4,285,986
	TOTAL	-	-	547,644,658	20,408,613,934	20,956,258,592

Table 2: Countries with Policies on Plastics/Single-Use Plastics (SUPs)

The following table lists the countries with different policies on plastics or single-use plastics.

S. No.	Plastics Policy	Countries[4]
1.	Countries that expressed commitment to a legally binding United Nations (UN) Treaty on plastic pollution	175 UN Member States[5]
2.	Countries/groups of countries with a ban on SUPsⁱ	Antigua and Barbuda, Argentina, Australia, Bangladesh, Belgium, Belize, Benin, Bhutan, Botswana, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Cape Verde, Chad, Chile, China, Colombia, Croatia, Cyprus, Czech Republic, Côte d'Ivoire, Denmark, Ecuador, Egypt, Eritrea, Estonia, Ethiopia, European Union, Fiji, France, Gambia, Greece, Guatemala, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Ireland, Israel, Italy, Kenya, Latvia, Lithuania, Malawi, Malaysia, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Netherlands, Niger, Pakistan, Palau, Panama, Papua New Guinea, Philippines, Portugal, Romania, Rwanda, Senegal, Slovakia, Somalia, South Africa, Spain, Sri Lanka, Saint Vincent and the Grenadines, Sweden, Tanzania, Tunisia, Uganda, United Kingdom, United States of America, Vanuatu, Vietnam and Zimbabwe
3.	Countries with a ban on SUPs at the manufacturer or retailer levelⁱⁱ	Antigua and Barbuda, Bangladesh, Benin, Bhutan, Botswana, Burkina Faso, Cameroon, Cape Verde, Chile, China, Colombia, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Eritrea, Estonia, Ethiopia, Fiji, France, Gambia, Greece, Guinea Bissau, Haiti, Ireland, Israel, Italy, Kenya, Lithuania, Malawi, Mali, Marshall Islands, Mauritania, Mauritius, Mongolia, Morocco, Mozambique, Netherlands, Niger, Palau, Panama, Papua New Guinea, Portugal, Romania, Rwanda, Senegal, Slovakia, South Africa, Sri Lanka, Tanzania, Tunisia, Uganda, Vanuatu and Zimbabwe

ⁱ This includes countries with a ban on SUPs at any level- city-wide or state-wide or federal/ national or sub-national levels.

ⁱⁱ This includes countries with a ban on SUPs at the national level.

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Plastic pollution from cigarette butts likely costs US\$26 billion/year or US\$186 billion over 10 years

Relatively small compared with overall toll of tobacco, but costs cumulative and preventable

Bans on single use plastics increasingly common, but tobacco sources overlooked

The costs of environmental pollution caused by plastics in cigarette butts and packaging amount to an estimated US\$26 billion every year or US\$186 billion every 10 years—adjusted for inflation—in waste management and marine ecosystem damage worldwide, finds a data analysis published online in the journal ***Tobacco Control***.

These costs may seem small compared with the overall economic and human toll of tobacco, but they are cumulative and preventable, highlights the researcher.

And although great strides have been made in developing policies to curb or ban single use plastics around the globe, tobacco's plastic has been overlooked, she adds.

This is despite the fact that cigarette filters—the main component of cigarette butts—are the most common item of rubbish collected on the planet. And they are made of single use plastic.

To try and gauge the global economic toll of tobacco products' toxic waste, and better inform tobacco control and environmental protection agencies, the researcher drew on currently available public data sources for cigarette sales, clean-up costs, and plastic waste on land and sea.

These sources included the World Bank, the Organization for Economic Cooperation and Development (OECD), The Tobacco Atlas, and the World Wildlife Fund.

The average weight of each plastic filter is 3.4 g. As cigarette butts are often littered along with plastic packaging, which weighs an average 19 g for a standard pack size of 20 cigarettes, this was also included in the calculations.

The researcher estimated the annual and 10-year projections of the environmental economic costs of tobacco plastic based on the tonnage. Ten-year projections were included because cigarette butts are reported to take 10 years to degrade.

The total figure reflects cost estimates of clean-up and disposal (adjusted for inflation) of the total plastic generated by filtered cigarette sales potentially ending up as waste in the sea, landfills, or in the environment.

The researchers estimated that the annual economic cost of cigarette plastics waste is around US\$26 billion, made up of US\$20.7 billion in marine ecosystem damage and US\$5 billion in waste management costs, adding up to US\$186 billion over 10 years.

“Although this amount is small compared with the annual economic losses from tobacco (US\$1.4 trillion per year) and may appear insignificant compared with the 8 million deaths attributable to tobacco each year, these environmental costs should not be downplayed as these are accumulating and are preventable,” emphasises the researcher.

Countries with the highest number of cigarette butts are mostly low and middle income countries—the same countries where the ‘leakage’ rate for plastics into the environment, thought to be between 1% and 14%, is likely higher, she adds.

The costs of tobacco product plastic pollution are likely highest in China, Indonesia, Japan, Bangladesh and the Philippines, the estimates suggest.

The researcher acknowledges that the figures are only estimates, but they are likely to be conservative, she says, because they don’t account for the toxic metals and chemicals in cigarette butts that accrue over time, making them more harmful than general plastic waste.

“Cigarette filters have been polluting our oceans and land for at least five decades, and these trash items may have a carrier effect with the toxic chemicals leached from them. Human and ecosystem impacts of this toxic chemical accumulation are unknown,” she writes.

“The general estimates provided here could provide fiscal evidence of the need to mitigate tobacco plastic waste pollution,” and the data could help “in assigning industry responsibility for these losses, including that of the [tobacco industry],” she suggests.

Policies to shift the responsibility for the clean-up costs to the tobacco industry are under consideration in France, the UK, the European Union and the USA, she adds.