

# TOBACCO: POISONING OUR PLANET

**Throughout its life cycle, tobacco  
pollutes the planet and damages  
the health of all people.**

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# TOBACCO HARMS THE PLANET

**T**obacco harms our health directly through use and exposure to second-hand smoke and through its negative impact on the environment. Tobacco's impact on the environment occurs at various stages, including growing and cultivation, manufacturing, distribution, use and disposal of tobacco products (1). Each of these stages has negative implications for the environment, including the use of precious resources such as water and trees and the creation of pollutants through manufacturing. Production and consumption of tobacco also contributes to global warming, releasing 80 million tonnes of carbon dioxide (CO<sub>2</sub>) into the environment each year, the equivalent of driving 17 million gasoline-powered cars each year.<sup>1</sup>

Tobacco's long history of negative implications for health is well known, including the increased risk of cardiovascular diseases, cancers and respiratory illnesses, but what is less often discussed is the harmful effects it has on the health of our planet. Long before these deadly products reach the consumer, they already leave a trail of destruction in their wake. Tobacco growing destroys forests, damages soil and depletes water supplies, while manufacturing contributes to the production of toxic waste.

Tobacco use pollutes the air we breathe, while also leaving residual nicotine and other harmful chemicals on indoor surfaces, thereby exposing non-smokers to second-hand and third-hand smoke toxins. Cigarette butts and other forms of tobacco product waste poison rivers, oceans and marine life, contaminate beaches and waterways and foul our urban living spaces (2).

The environmental insult associated with tobacco production and use is a growing concern, complicated by newer electronic smoking devices and nicotine delivery products. These devices contain metals, plastics and batteries which are classified as toxic hazardous waste, whether they are littered into the environment or properly disposed of in a waste bin.

Finally, tobacco production affects the air we breathe, even before the tobacco is smoked. The tobacco product life cycle produces a significant amount of CO<sub>2</sub>. Approximately 14 grams of CO<sub>2</sub> are emitted per cigarette over its whole life cycle (1).

Tobacco control works but the adoption of effective tobacco control measures is often slowed down or impaired by policy-makers, who are still not fully aware of the environmental damage caused by tobacco growing, manufacture, distribution and post-consumer tobacco waste.

PRODUCTION AND CONSUMPTION OF TOBACCO  
ALSO CONTRIBUTE TO GLOBAL WARMING,  
RELEASING  
**80 MILLION TONNES**  
OF CARBON DIOXIDE (CO<sub>2</sub>) INTO THE  
ENVIRONMENT EACH YEAR.

## KEY FACTS

- 22 billion tonnes of water used in tobacco production globally – approximately 3.5 times the water volume of Lake Chad
- 2 million tonnes of packaging waste – the weight of 9433 freight trains
- The trees cut down to make way for tobacco growing make up 5% of global deforestation – an area roughly half the size of Cabo Verde disappears every year.



<sup>1</sup> A typical passenger vehicle emits approx. 4.6 tonnes of CO<sub>2</sub> per year (assuming a fuel economy of approx. 22 miles per United States gallon (0.0038 tonnes) and an annual mileage of 11 500 miles (18 508 kilometres (km)). Every gallon of gasoline burned creates about 8887 grams of CO<sub>2</sub>.

# TOBACCO PRODUCT LIFE CYCLE



FIG 1. IMPACT OF TOBACCO LIFE CYCLE ON HEALTH, ENVIRONMENT AND ECONOMICS

Fig. 1 summarizes the impact of each of the five stages of the tobacco production and consumption life cycle (farming/cultivation, production, consumption, disposal and “residual” tobacco waste that remains in the environment) on our health, environments and economies. The figure illustrates how every stage of the tobacco life cycle impacts several different factors, contributing to long-lasting and persistent adverse effects (1–4).

farmers are often under contractual arrangements with the tobacco industry and are trapped in a vicious circle of debt incurred in the purchase of seeds and chemicals, making the farmer unable to benefit fully from the lucrative tobacco market. Tobacco farmers may also earn less than other farmers in the agricultural sector, and agricultural land may be diverted from food growing to the tobacco cash crop.

## FARMER LIVELIHOOD AND HEALTH

Tobacco farmers and their families are exposed to several health risks. As many as 25% of tobacco farmers (5) are affected by green tobacco sickness (nicotine poisoning), a disease caused by nicotine absorbed through the skin from the handling of tobacco leaves. Tobacco farmers are exposed daily to “tobacco dust” and other chemical pesticides. A tobacco farmer who plants, cultivates and harvests tobacco may absorb as much nicotine as is found in 50 cigarettes (6). In addition to direct exposures, tobacco farmers often bring harmful exposures back home on their bodies, clothes or shoes, leading to secondary harmful exposures for their families.

Children are particularly vulnerable, given their body weight relative to the proportion of nicotine absorbed through their skin (6). Pregnant women are disproportionately affected by the harmful effects of tobacco farming and face a higher risk of miscarriage (5). From a socioeconomic perspective, tobacco

## AGROCHEMICAL USE

Tobacco growing is resource-intensive and requires heavy use of pesticides and fertilizers, which contribute to soil degradation (7–10). These chemicals escape into the aquatic environment, contaminating lakes, rivers and drinking water. Land used for growing tobacco then has a lower capacity for growing other crops, such as food, since tobacco depletes soil fertility. The economic lure of tobacco as a cash crop may not offset the damage done to sustainable food production in low- and middle-income countries (8).

## WATER DEPLETION

Depletion of precious water resources is another harmful consequence of tobacco production. A single cigarette requires the use of about 3.7 litres (L) of water over its life cycle, from growing/cultivation, manufacturing, transportation and use to

disposal (1). Every year, about 22 billion tonnes of water are used in tobacco production globally (1). This is the equivalent of 15 million Olympic-sized swimming pools, or roughly the volume of water discharged by the Amazon, the largest river by water flow in the world, in one day.

Tobacco requires up to eight times more water than, for example, tomatoes or potatoes. For every kilogram (kg) of tobacco that is not produced, consumed and disposed of, the potable water needs of one person can be met for an entire year (11).

These water-use estimates are likely an underestimate. A large proportion of tobacco product waste, which consists mostly of cigarette butts, finds its way into bodies of water and water sources, primarily through storm water systems, seepage from landfills, or direct littering into water or area near water (for example, beaches or parks). If we conservatively assume that one cigarette butt can pollute as much as 100 L of water (estimates range from 30 L to 1000 L, depending on a variety of factors), even if only 25% of the global 4 trillion littered butts per year make into bodies of water, this would result in another 100 trillion litres of water consumed by the tobacco product life cycle, which, combined with the 22 billion tonnes associated with farming and manufacturing, would be equal to about 3.5 times the water volume of Lake Chad in central Africa.

## DEFORESTATION AND LAND DEGRADATION

Deforestation and soil depletion and erosion are also a serious concern. To make space for tobacco growing and to obtain wood for curing, trees must be cut down and land cleared. Approximately one tree is needed to make 300 cigarettes. Tobacco farming accounts for about 5% of total deforestation.

Most of the deforested land is in the very high-risk group in the desertification tension zones (12), including southern Africa, the Middle East, south and east Asia, Latin America and the Caribbean (13). Approximately 200 000 hectares (ha) of land are cleared for tobacco agriculture and curing each year (14), which is the equivalent of almost half the entire land area of Cabo Verde (403 000 ha). Wood is required to flue-cure or dry the tobacco leaves after harvesting. Compared with other agricultural activities such as maize growing and even livestock grazing, tobacco farming has a far more destructive impact on ecosystems as tobacco farm lands are more prone to desertification. Against this background, taking legal measures to reduce tobacco growing and help farmers to move into the production of other food seems to be more efficient than other well intentioned initiatives.

## CARBON EMISSIONS

The manufacturing and distribution of tobacco products are environmentally damaging steps in the tobacco life cycle because of their extensive use of energy, water and other resources. Overall, these processes generate a substantial amount of carbon emissions, estimated to equal 3 million transatlantic flights (15). They include energy and water use for growing tobacco, shredding and reconstituting the tobacco leaf, freezing and artificially expanding the surface area of reconstituted tobacco, producing paper used in commercial cigarettes or as rolling paper used by the consumer, producing cigarette filters and producing packaging and advertising materials. The logistics of leaf importation and distribution from manufacturers to wholesalers and retailers by truck, boat, rail or other means of transport creates an additional carbon footprint (16).



## HEALTH RISKS OF TOBACCO

**T**obacco use, whether it involves smoked or smokeless tobacco, is associated with a substantial human and economic burden. Smoking is associated with increased risk of cardiovascular disease, respiratory illness, cancer, diabetes, hypertension and more (17–19). Health-care expenditures due to smoking-attributable diseases amounted to US\$ 422 billion in 2012, or 5.7% of global health expenditures (20). The total economic cost of smoking (health expenditures plus productivity losses) amounted to US\$ 1436 billion in 2012, equivalent in magnitude to 1.8% of the world's annual gross domestic product. About 40% of this cost occurred in developing countries.

### DIRECT, SECOND-HAND AND THIRD-HAND SMOKE EXPOSURE

Tobacco smoking in indoor public places and workplaces, including homes, contributes to toxicants in the air breathed by occupants, and these toxicants can cause disease in those who do not use tobacco themselves. More than 7000 chemicals have been identified in tobacco smoke, and at least 70 are known to cause cancer in humans and animals (21). Third-hand smoke is the residue of tobacco smoke and its constituent chemicals that remains on surfaces and in dust after tobacco has been smoked indoors. These substances contaminate surfaces and ambient

air, and they react with oxidants and other compounds in the environment to yield secondary pollutants. This contamination results in significant costs to remove residues, and can harm the health of infants and toddlers living in the home. School-aged children exposed to the harmful effects of second-hand smoke are also at risk for asthma, owing to lung inflammation caused by second-hand smoke exposure (15).



## ENVIRONMENTAL FOOTPRINT OF TOBACCO ACROSS THE SUPPLY CHAIN

### POLLUTION FROM PACKAGING AND TRANSPORTATION

The transport of tobacco products also contributes to CO<sub>2</sub> pollution, and the use of plastics in filters and packaging material is an environmental concern. An estimated 6 trillion cigarettes are manufactured every year, and these are marketed in about 300 billion packages composed of paper, ink, cellophane, foil and glue. The waste from cartons and boxes used for distribution and packing of tobacco products in 2021 produced waste of at least 2 million tonnes, which equals the weight of 9433 freight trains or 17 000 times the weight of the Bell of Good Luck in Henan Province, China – the heaviest bell in the world.

Smokeless tobacco, in forms such as chewing tobacco and nicotine pouches, are made of single-use plastic and metal for packaging, which produces solid waste and results in additional pressure on landfill, as well as toxic chemical leakage into the environment from landfill.

### TOXIC WASTE POLLUTING WATER AND MARINE LIFE

The vast majority of waste produced throughout the tobacco product life cycle is hazardous. About 4.5 trillion discarded cigarette butts present a danger to the environment, as well as the millions of tonnes of greenhouse gas emissions they produce (1). Cellulose-acetate-based cigarette filters do not biodegrade and can remain in the environment for very long periods of time in the form of microplastics (22–24), which could cause significant harm to the marine environment (25–28) and lake, river, estuary and wetland aquatic environments (29) through their uptake in the aquatic environment and ecosystem (28). The filters also release into ecosystems nicotine, heavy metals and other chemicals that they have absorbed. This in turn affects the livelihood and health of fishing communities living in coastal areas, and those who consume seafood products affected by the contamination.

## AIR POLLUTION

Tobacco smoke contains three major greenhouse gases (CO<sub>2</sub>, methane and nitrous oxides), in addition to other air pollutants. Tobacco smoke produces higher particulate matter pollution than diesel exhaust (30). Discarded cigarettes also remain an important cause of accidental fires, wildfires and fire deaths (15). In 2010, one cigarette butt ignited a major fire in India, which led to the burning of 60 ha of forest (14).

ABOUT

**4.5 TRILLION**

DISCARDED CIGARETTE BUTTS PRESENT A DANGER TO THE ENVIRONMENT, AS WELL AS THE MILLIONS OF TONNES OF GREENHOUSE GAS EMISSIONS THEY PRODUCE.

SOURCE: (31).

## KEY FACTS

- In 2014, 22 200 megatons of water, 5.3 million ha of land, 62.2 petajoules of energy and 27.2 megatons of material resources went into creating 6 trillion cigarettes
- Cigarettes were manufactured in nearly 500 factories across 125 countries, and produced 6.48 megatons of dry tobacco and 32.4 megatons of green tobacco leaf
- All this activity produced 25 megatons of solid waste, 55 megatons of wastewater and 84 megatons of CO<sub>2</sub> emissions, or the equivalent of 280 000 Saturn V rocket launches to outer space. This is equivalent to one fifth of the CO<sub>2</sub> produced by the commercial airline industry each year.

## ELECTRONIC WASTE FROM NOVEL AND EMERGING PRODUCTS

Additional harm to the environment is caused by improper disposal of electronic waste (e-waste) from electronic nicotine delivery systems such as e-cigarettes, one-time use electronic cigarettes and heated tobacco products, which also generate toxic emissions and waste products. Little is documented about the harmful effects on the environment brought about by the production of these devices, but the disposal of e-cigarette cartridges and batteries represents a major environmental concern (32). The majority of plastic e-cigarette liquid cartridges are not reusable or recyclable and end up in gutters, streets and waterways (15).

These products contain plastics, metal coils, atomizers, batteries, microcontroller chips and chargers. For example, the blade of an iQOS heated tobacco product is made of platinum and gold, coated in ceramic. Many of these products are single-use disposable products made with non-biodegradable and non-recyclable materials that can cause damage to the environment.

## GREENWASHING TACTICS

**D**uplicitious tactics are used by the tobacco industry to greenwash its reputation and construct the image of a sustainable and eco-friendly industry. These tactics are used strategically to cover up the detrimental harm of tobacco farming, production, consumption and waste on the environment, on tobacco farmers and on communities. One example is the marketing and eco-labelling of cigarettes as “natural” or “organic” (33), suggesting to smokers that these products are somehow less harmful. Through corporate social responsibility schemes and social investment, the industry funds schools, health systems, environmental and disaster relief organizations and clean-up programmes for tobacco product waste. This is

particularly true for low- and middle-income countries, and the strategy seeks recognition for the industry contributions to the public good. However, the industry’s self-reported data are intended to mislead the public and sustain its operations in tobacco-growing countries and lack essential information on the sheer size of destruction imposed on the environment and communities (34). They focus mainly on the way the industry tries to reduce its manufacturing carbon footprint and shift the responsibility for waste mitigation downstream to jurisdictions, communities and voluntary groups.

## EXTENDED PRODUCER RESPONSIBILITY

**S**urveys of littering behaviour have found that 65% of smokers discard cigarette butts improperly (35). Consequently, tobacco product waste consistently ranks among the most prevalent of all collected waste and litter, estimated to be at least 25–40% of all global litter. The most recent global litter survey conducted as part of the Ocean Conservancy’s International Coastal Cleanup (ICC) initiative found that tobacco product waste comprised 11% of all littered items (36). However, several other studies have found higher percentages (37). In terms of weight, globally, the annual waste generated by tobacco products comprises 680 388 tonnes of product waste from cigarette butts, 907 184 tonnes from tobacco manufacturing and approximately 25 million tonnes from the overall tobacco life cycle (38). Improperly discarded tobacco products can cause poisoning, through accidental ingestion (39–43) and can cause fires in homes (44–47) and in public spaces, including potentially devastating forest fires (48). The myriad harmful effects of tobacco product waste are a “negative externality” associated with the use of tobacco products and have become a mounting public health and economic problem (49–53).

In most countries, governments and local authorities are left with the clean-up and disposal cost of tobacco product waste, a cost which should be borne by the tobacco companies themselves. In France, the annual clean-up cost of 23 billion cigarette butts amounts to 100 million Euro each year (54). To mitigate this problem and hold the industry accountable, France has recently implemented a policy approach known as “extended producer responsibility”, based on the “polluter pays” principle. This means that the tobacco industry should be responsible for the cost of improperly discarded tobacco product waste, such as cigarette butts and e-cigarette waste (54). These funds can, in turn, be used to set up environmental restoration programmes, advance and enforce environmental and tobacco control

policies, educate the public as to the impacts of tobacco product waste and set the stage for further upstream approaches to the environmental insults caused by tobacco (7).

WHO has listed numerous criteria in the 2017 report Tobacco and its environmental impact: an overview (55), which can be used by national authorities to determine how tobacco product waste could be mitigated through extended producer responsibility and product stewardship principles and standards. Advocates must be aware, however, of the risks involved in considering the tobacco industry as a stakeholder in this process; it simply cannot be trusted and could, in fact, create challenges in terms of implementation, funding streams and policy manipulation.



## ENVIRONMENTAL TAX

To tackle the climate crisis and mitigate the environmental damage imposed by industry, the European Union has proposed a levy on carbon-intensive products (56) based on the amount of carbon emissions resulting from a specific product (57), such as a tobacco product.

Some countries and cities have imposed an environmental tax levy on tobacco products, as described below. In 2010, the

City of San Francisco implemented a fee to pay for cleaning up cigarette waste, such as cigarette butts and plastic packaging, as well as enforcing restrictions on littering and providing public information messaging. The fee started at 20 cents per pack in 2010, and has since increased to 75 cents per pack (58).

Gambia applies an **environment tax** of 2.93 Gambian dalasi per pack, equivalent to **4.2%** of the retail price

Chad applies an **environmental protection tax** of 10 Central African CFA francs per pack, equivalent to **2.0%** of the retail price

Benin applies an **eco tax** of **5% on the cost, insurance and freight price**, which is equivalent to **0.4%** of the retail price



## CALL TO ACTION

### GENERAL PUBLIC

- 1 Advocate for a cleaner environment free of tobacco product waste to protect the ecosystem.
- 2 Encourage tobacco users to quit by educating them on the negative environmental impacts of tobacco; quitting tobacco benefits people's health as well as the environment.
- 3 Support policy action for a ban on single-use plastics, which include cigarette filters, smokeless tobacco pouches and disposable electronic nicotine delivery systems.
- 4 Raise awareness of the tobacco industry's greenwashing tactics.
- 5 Support governments in introducing additional levies and taxes on industry to protect the environment.

### YOUTH AND FUTURE GENERATIONS

- 1 Advocate for 100% tobacco free schools to protect children and youth from exposure to direct, second-hand and third-hand smoke and keep schools free from cigarette butts.
- 2 Start or join a movement to protect the environment; raise awareness about the environmental impact of tobacco and sensitize the public, in particular young people.
- 3 Reduce the number of tobacco retail stores.



### MINISTRIES AND POLICY-MAKERS (HEALTH, ENVIRONMENT, EDUCATION, RURAL DEVELOPMENT, FINANCE/ECONOMIC MINISTRIES)

- 1 Impose the policy principle of extended producer responsibility on the tobacco industry to hold it accountable for the cost of cleaning up tobacco product waste.
- 2 Impose an environmental tax levy on tobacco manufacturers, distributors and the consumer, across the supply chain, for carbon emissions, air pollution and other environmental costs.
- 3 Cigarette filters do not have any proven health benefits and harm the environment. If cigarette filters, as they are currently designed, were treated appropriately as single-use plastics, consideration should be given to banning cigarette filters to protect public health and the environment.
- 4 Implement tobacco control (MPOWER (59)) measures to reduce the environmental impact of tobacco.
- 5 Raise awareness about harms to the environment and actions that need to be prioritized to reduce tobacco use in society, including in school curriculums and training programmes for the health and environment workforce.
- 6 Support tobacco farmers in switching to alternative livelihoods to reduce the environmental impact of tobacco growing, curing and manufacturing, in line with Articles 17 and 18 of the WHO Framework Convention on Tobacco Control (WHO FCTC).
- 7 Advise governments on ways of making use of the 27th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27), to be held in Cairo in November 2022, to collaborate and advance the tobacco control agenda in line with World No Tobacco Day (60).

## NONGOVERNMENTAL ORGANIZATIONS AND CIVIL SOCIETY

- 1 Raise awareness of the environmental impact of tobacco across the life cycle from cultivation, production, distribution, use and waste.
- 2 Showcase the tobacco waste problem in public spaces and communities.
- 3 Raise awareness of the benefits for tobacco farmers of switching to different crops (as has been done in Brazil and Kenya, for instance) and how this is linked to tobacco control more broadly.
- 4 Advocate for national bans on single-use plastics
- 5 Expose tobacco industry tactics and efforts to greenwash its reputation and products by marketing itself as environmentally friendly.

THE TOBACCO INDUSTRY WANTS YOU TO

BELIEVE THEIR DESTRUCTIVE

PRODUCTS AND PRACTICES ARE

SUSTAINABLE, EVEN WHEN

4.5 TRILLION CIGARETTE BUTTS

POLLUTE THE ENVIRONMENT EVERY YEAR.

## TOBACCO FARMERS

- 1 Switch to sustainable and environmentally friendly crops, providing a greater return on investment in terms of health and wealth.



## ACADEMIA AND INTERGOVERNMENTAL ORGANIZATIONS, INCLUDING UNITED NATIONS ENTITIES AND DEVELOPMENT BANKS

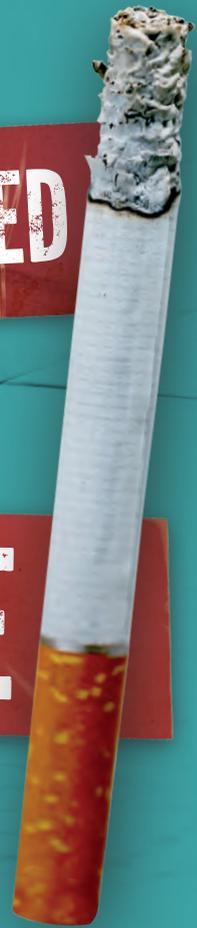
- 1 Collect data on water use, deforestation, soil depletion and the lethal and environmentally degrading chemicals in tobacco products and the environmental harm of these components for soil, drinking water and human and animal health.
- 2 Estimate the total impact of tobacco product waste, as well as the total environmental impact of a single tobacco product.
- 3 Raise awareness of ongoing projects in tobacco-growing countries, for example in Kenya, where hundreds of farmers have successfully switched to alternative crops, as well as deforestation and climate change projects, especially in low- and middle-income countries in Asia and Africa.
- 4 Raise awareness of the linkages between environmental impact of tobacco and health outcomes, linking it to adverse health and development outcomes.
- 5 Remind stakeholders that accelerated implementation of the WHO FCTC is a target of SDG target 3.a.

#NoTobacco

**3.7 LITRES OF WATER USED**

**TO MAKE**

**ONE CIGARETTE**



## COMPARATORS FOR REFERENCE

BROCHURE FACT	CONVERSION	COMPARATOR
<b>22 BILLION TONNES</b> of water used in tobacco production globally every year	<b>1 GALLON = 0.0038 TONNES</b>	<b>APPROXIMATELY 3.5 TIMES THE WATER VOLUME OF LAKE CHAD IN CENTRAL AFRICA</b>
	Average discharge of <b>18 BILLION TONNES OF WATER PER DAY</b> (209 000 square metres (m <sup>3</sup> )/second)	<b>APPROXIMATELY THE SAME VOLUME OF WATER DISCHARGED BY THE AMAZON RIVER IN ONE DAY –THE LARGEST RIVER BY WATER FLOW IN THE WORLD</b>
<b>678 L OF WATER PER 1 KG</b> of tobacco during cultivation stage	<b>A STANDARD BATH TUB HOLDS 302 L</b>	<b>2.25 BATHTUBS FULL OF WATER PER 1 KG OF TOBACCO. FOR EVERY 1 KG OF TOBACCO THAT IS NOT PRODUCED, CONSUMED AND DISPOSED OF, THE POTABLE WATER NEEDS OF ONE PERSON CAN BE MET FOR AN ENTIRE YEAR</b>
	1 ha = 0.01 km <sup>2</sup>	<b>ALMOST THE ENTIRE LAND AREA OF LUXEMBOURG (2584 KM<sup>2</sup>)</b>
<b>200 000 HA OF LAND</b> cleared for tobacco agriculture each year	<b>AVERAGE FREIGHT TRAIN = 212 TONNES</b>	<b>9433 FREIGHT TRAINS</b>
<b>2 MILLION TONNES</b> of packaging waste		
	Bell of Good Luck in China (heaviest bell in the world) = <b>254 000 TONNES</b>	<b>17 000 BELLS OF GOOD LUCK</b>
	Saturn V rocket (first rocket to bring mankind to the moon) = <b>3125 TONNES</b>	<b>639 SATURN V ROCKETS</b>
<b>84 MEGATONS</b> of CO <sub>2</sub>	1 rocket launch = <b>300 TONNES OF CO<sub>2</sub> EMISSIONS</b>	<b>280 000 SATURN V ROCKET LAUNCHES TO OUTER SPACE</b>

## REFERENCES

- 1 Zafeiridou M, Hopkinson NS, Voulvoulis N. Cigarette smoking: an assessment of tobacco's global environmental footprint across its entire supply chain. *Environ Sci Technol*. 2018;52(15):8087–94. doi:10.1021/acs.est.8b01533.
- 2 Our world is being burned by tobacco: it's time to talk about it. In: STOP [website]. Bath: STOP; 2022 (<https://exposetobacco.org/campaigns/burned-by-tobacco/>, accessed 18 April 2022).
- 3 Araújo MCB, Costa MF. From plant to waste: the long and diverse impact chain caused by tobacco smoking. *Int J Environ Res Public Health*. 2019;16(15):2690. doi:10.3390/ijerph16152690.
- 4 Novotny TE, Bialous SA, Burt L, Curtis C, da Costa VL, Iqtidar SU et al. The environmental and health impacts of tobacco agriculture, cigarette manufacture and consumption. *Bull World Health Organ*. 2015;93(12):877–80. doi:10.2471/BLT.15.152744.
- 5 Tobacco farming. In: Tobacco Tactics [website]. Bath: University of Bath; 2020 (<https://tobaccotactics.org/wiki/tobacco-farming/>, accessed 18 April 2022).
- 6 Kulik MC, Bialous SA, Munthali S, Max W. Tobacco growing and the Sustainable Development Goals, Malawi. *Bull World Health Organ*. 2017;95(5):362–7. doi:10.2471/BLT.16.175596.
- 7 Hussain AG, Rouf ASS, Shimul SN, Nargis N, Kessaram TM, Huq SM et al. The economic cost of tobacco farming in Bangladesh. *Int J Environ Res Public Health*. 2020;17(24):9447. doi:10.3390/ijerph17249447.
- 8 Lecours N, Almeida GEG, Abdallah JM, Novotny TE et al. Environmental health impacts of tobacco farming: a review of the literature. *Tob Control*. 2012;21(2).
- 9 Zhang Y, He X, Liang H, Zhao J, Zhang Y, Xu C et al. Long-term tobacco plantation induces soil acidification and soil base cation loss. *Environ Sci Pollut Res Int*. 2016;23(6):5442–50.
- 10 Zoffoli HJ, do Amaral-Sobrinho NM, Zonta E, Luisi MV, Marcon G, Tolón-Becerra A. Inputs of heavy metals due to agrochemical use in tobacco fields in Brazil's Southern Region. *Environ Monit Assess*. 2013;185(3):2423–37. doi:10.1007/s10661-012-2721-y.
- 11 Armstrong LE, Johnson EC. Water intake, water balance, and the elusive daily water requirement. *Nutrients*. 2018;10(12):1928. doi:10.3390/nu10121928.
- 12 Eswaran H, Reich P, Beinroth F. Global desertification tension zones. In: Natural Resources Conservation Service [website]. Washington, DC: United States Department of Agriculture; 1998 ([https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs142p2\\_054030](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs142p2_054030), accessed 18 April 2022).
- 13 Geist HJ. Global assessment of deforestation related to tobacco farming. *Tob Control*. 1999;8(1):18–28.
- 14 Tobacco control for sustainable development. New Delhi: WHO Regional Office for South-East Asia; 2017 (<https://apps.who.int/iris/handle/10665/255509>, accessed 18 April 2022).
- 15 More than 100 reasons to quit tobacco. In: World Health Organization [website]. Geneva: World Health Organization; 2022 (<https://www.who.int/news-room/spotlight/more-than-100-reasons-to-quit-tobacco>, accessed 18 April 2022).
- 16 Hendlin YH, Bialous SA. The environmental externalities of tobacco manufacturing: a review of tobacco industry reporting. *Ambio*. 2020;49(1):17–34. doi:10.1007/s13280-019-01148-3.
- 17 Feirman SP, Glasser AM, Teplitskaya L, Holtgrave DR, Abrams DB, Niaura RS et al. Medical costs and quality-adjusted life years associated with smoking: a systematic review. *BMC Public Health*. 2016;16:646. doi:10.1186/s12889-016-3319-z.

- 18 Kuper H, Adami H-O, Boffetta P. Tobacco use, cancer causation and public health impact. *J Intern Med.* 2002;251(6):455–66. doi:10.1046/j.1365-2796.2002.00993.x.
- 19 Mitchell BE, Sobel HL, Alexander MH. The adverse health effects of tobacco and tobacco-related products. *Prim Care.* 1999;26(3):463–98. doi:10.1016/s0095-4543(05)70113-5.
- 20 Goodchild M, Nargis N, Tursan d’Espaignet E. Global economic cost of smoking-attributable diseases. *Tob Control.* 2018;27(1):58–64. doi:10.1136/tobaccocontrol-2016-053305.
- 21 Environmental tobacco smoke (ETS): general information and health effects. In: Canadian Centre for Occupational Health and Safety [website]. Hamilton, ON: Canadian Centre for Occupational Health and Safety; 2022 ([https://www.ccohs.ca/oshanswers/psychosocial/ets\\_health.html](https://www.ccohs.ca/oshanswers/psychosocial/ets_health.html), accessed 18 April 2022).
- 22 Belzagui F, Buscio V, Gutiérrez-Bouzán C, Vilaseca M. Cigarette butts as a microfiber source with a microplastic level of concern. *Sci Total Environ.* 2021;762:144165. doi:10.1016/j.scitotenv.2020.144165.
- 23 El Hadri H, Lisa JM, Gigault J, Reynaud S, Grassl B. Fate of nanoplastics in the environment: implication of the cigarette butts. *Environ Pollut.* 2021;268(Pt B):115170 (<https://www.ncbi.nlm.nih.gov/pubmed/33035875>, accessed 18 April 2022).
- 24 Shen M, Li Y, Song B, Zhou C, Gong J, Zeng G. Smoked cigarette butts: unignorable source for environmental microplastic fibers. *Sci Total Environ.* 2021;791:148384. doi:10.1016/j.scitotenv.2021.148384.
- 25 Beaumont NJ, Aanesen M, Austen MC, Börger T, Clark JR, Cole MC et al. Global ecological, social and economic impacts of marine plastic. *Mar Pollut Bull.* 2019;142:189–95 (<https://doi.org/10.1016/j.marpolbul.2019.03.022>, accessed 18 April 2022).
- 26 Derraik JGB. The pollution of the marine environment by plastic debris: a review. *Mar Pollut Bull.* 2002;44(9):842–52. doi:10.1016/s0025-326x(02)00220-5.
- 27 Moore CJ. Synthetic polymers in the marine environment: a rapidly increasing, long-term threat. *Environ Res.* 2008;108(2):131–9. doi:10.1016/j.envres.2008.07.025.
- 28 Slaughter E, Gersberg RM, Watanabe K, Rudolph J, Stransky C, Novotny TE. Toxicity of cigarette butts, and their chemical components, to marine and freshwater fish. *Tob Control.* 2011;20:i25–i29. doi:10.1136/tc.2010.040170.
- 29 Dobaradaran S, Soleimani F, Akhbarizadeh R, Schmidt TC, Marzban M, Basirian Jahromi R. Environmental fate of cigarette butts and their toxicity in aquatic organisms: a comprehensive systematic review. *Environ Res.* 2021;195:110881. doi:10.1016/j.envres.2021.110881.
- 30 Invernizzi G, Ruprecht A, Mazza R, Rossetti E, Sasco A, Nardini S et al. Particulate matter from tobacco versus diesel car exhaust: an educational perspective. *Tob Control.* 2004;13:219–221 (<http://dx.doi.org/10.1136/tc.2003.005975>, accessed 18 April 2022).
- 31 Dunning H, Wilson J. Cigarettes have a significant impact on the environment, not just health. In: Imperial College London [website]. London: Imperial College; 2018 (<https://www.imperial.ac.uk/news/188406/cigarettes-have-significant-impact-environment-just/>, accessed 18 April 2022).
- 32 Chang H. Research gaps related to the environmental impacts of electronic cigarettes. Research gaps related to the environmental impacts of electronic cigarettes. *Tob Control.* 2014;23:ii54–ii58 ([https://tobaccocontrol.bmj.com/content/23/suppl\\_2/ii54](https://tobaccocontrol.bmj.com/content/23/suppl_2/ii54), accessed 18 April 2022).
- 33 Houghton F, Houghton S, O’ Doherty D, McInerney D, Duncan B. ‘Greenwashing’ tobacco products through ecological and social/equity labelling: a potential threat to tobacco control. *Tob Prev Cessation.* 2018;4:37. doi:10.18332/tpc/99674.
- 34 Greenwashing. In: Tobacco Tactics [website]. Bath: University of Bath; 2020 (<https://tobaccotactics.org/wiki/greenwashing/>, accessed 18 April 2022).
- 35 Schultz PW, Large LB, Tabanico J, Bruni C, Bator R. Littering behavior in America: results of a national study. San Marcos, CA: Action Research/Keep America Beautiful; 2009.

- 36 We clean on: 2021 report of the Ocean Conservancy International Coastal Cleanup. Washington, DC: Ocean Conservancy International Coastal Cleanup; 2021 ([https://oceanconservancy.org/wp-content/uploads/2021/09/2020-ICC-Report\\_Web\\_FINAL-0909.pdf](https://oceanconservancy.org/wp-content/uploads/2021/09/2020-ICC-Report_Web_FINAL-0909.pdf), accessed 18 April 2022).
- 37 2009 National visible litter survey and litter cost study. New Market, MD: Keep America Beautiful/Mid-Atlantic Solid Waste Consultants, 2009 ([https://kab.org/wp-content/uploads/2019/08/News-Info\\_Research\\_2009\\_NationalVisibleLitterSurveyandCostStudy\\_Final.pdf](https://kab.org/wp-content/uploads/2019/08/News-Info_Research_2009_NationalVisibleLitterSurveyandCostStudy_Final.pdf), accessed 18 April 2022).
- 38 Kaza S, Yao LC, Bhada-Tata P, Van Woerden F. What a waste 2.0: a global snapshot of solid waste management to 2050. Washington, DC: World Bank; 2018 (<https://openknowledge.worldbank.org/handle/10986/30317>, accessed 18 April 2022). Licence: CC BY 3.0 IGO.
- 39 Appleton S. Frequency and outcomes of accidental ingestion of tobacco products in young children. *Regul Toxicol Pharmacol*. 2011;61(2):210–4. doi:10.1016/j.yrtph.2011.07.010. Epub 2011 Jul 29.
- 40 Borys DJ, Setzer SC, Ling LJ. CNS depression in an infant after the ingestion of tobacco: a case report. *Vet Hum Toxicol*. 1988;30(1):20–2.
- 41 United States Centers for Disease Control and Prevention. Ingestion of cigarettes and cigarette butts by children – Rhode Island, January 1994–July 1996. *MMWR Morb Mortal Wkly Rep*. 1997;46(6):125–8 (<https://www.cdc.gov/mmwr/preview/mmwrhtml/00046181.htm>, accessed 18 April 2022).
- 42 Connolly GN, Richter P, Aleguas A Jr, Pechacek TF, Stanfill SB, Alpert HR. Unintentional child poisonings through ingestion of conventional and novel tobacco products. *Pediatrics*. 2010;125(5):896–9. doi:10.1542/peds.2009-2835.
- 43 McGee D, Brabson T, McCarthy J, Picciotti M. Four-year review of cigarette ingestions in children. *Pediatr Emerg Care*. 1995;11(1):13–16. doi:10.1097/00006565-199502000-00004.
- 44 Ahrens M. Home fires started by smoking. Quincy, MA: National Fire Protection Association; 2019 (<https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/US-Fire-Problem/Fire-causes/ossmoking.ashx>, accessed 18 April 2022).
- 45 Butry DT, Thomas DS. Cigarette fires involving upholstered furniture in residences: the role that smokers, smoker behavior, and fire standard compliant cigarettes play. *Fire Technol*. 2017;53(3):1123–46. doi:10.1007/s10694-016-0621-3.
- 46 United States Centers for Disease Control and Prevention. Deaths resulting from residential fires – United States, 1991. *MMWR Morb Mortal Wkly Rep*. 1994;43(49):901–4.
- 47 Leistikow BN, Martin DC, Milano CE. Fire injuries, disasters, and costs from cigarettes and cigarette lights: a global overview. *Prev Med*. 2000;31(2 Pt 1):91–9. doi:10.1006/pmed.2000.0680.
- 48 Wildfire causes and evaluations. Washington, DC: United States National Park Service; 2018.
- 49 Novotny TE, Zhao F. Consumption and production waste: another externality of tobacco use. *Tob Control*. 1999;8(1):75–80. doi:10.1136/tc.8.1.75.
- 50 Holtz J. THE WEEK; tobacco trash dominates haul at state shoreline. *New York Times*. 30 July 2006 (<https://www.nytimes.com/2006/07/30/nyregion/the-week-tobacco-trash-dominates-haul-at-state-shoreline.html>, accessed 18 April 2022).
- 51 Kaufman L. Cigarette butts: tiny trash that piles up. *New York Times*. 28 May 2009.
- 52 Novotny TE, Lum K, Smith E, Wang V, Barnes R. Cigarettes butts and the case for an environmental policy on hazardous cigarette waste. *Int J Environ Res Public Health*. 2009;6(5):1691–705. doi:10.3390/ijerph6051691.
- 53 A rising tide of ocean debris: report of the 2009 International Coastal Cleanup. Washington DC: Ocean Conservancy; 2009 (<https://oceanconservancy.org/wp-content/uploads/2017/04/2009-Ocean-Conservancy-ICC-Report.pdf>, accessed 18 April 2022).

- 54 Fullalove E. Tobacco manufacturers to pay for cigarette butt clean-up in France. The Connexion. 9 July 2021 (<https://www.connexionfrance.com/French-news/Tobacco-manufacturers-to-pay-for-cigarette-butt-clean-up-in-France>, accessed 18 April 2022).
- 55 Tobacco and its environmental impact: an overview. Geneva: World Health Organization; 2017 (<https://apps.who.int/iris/bitstream/handle/10665/255574/9789241512497-eng.pdf>, accessed 18 April 2022). Licence: CC BY-NC-SA 3.0 IGO.
- 56 What is a carbon border tax and what does it mean for trade? In: World Economic Forum [website]. Geneva: World Economic Forum; 2022; (<https://www.weforum.org/agenda/2021/10/what-is-a-carbon-border-tax-what-does-it-mean-for-trade/>, accessed 18 April 2022).
- 57 Carbon border adjustment mechanism. In: Taxation and Customs Union [website]. Brussels: European Commission; 2022 ([https://ec.europa.eu/taxation\\_customs/green-taxation-0/carbon-border-adjustment-mechanism\\_en](https://ec.europa.eu/taxation_customs/green-taxation-0/carbon-border-adjustment-mechanism_en), accessed 18 April 2022).
- 58 Sabatini J. SF's cigarette 'litter' fee on packs sold increases to 60 cents. San Francisco Examiner. 2 January 2017 (<https://www.sfexaminer.com/news/sfs-cigarette-litter-fee-on-packs-sold-increases-to-60-cents/>, accessed 18 April 2022).
- 59 MPOWER. In: World Health Organization [website]. Geneva: World Health Organization; 2022 (<https://www.who.int/initiatives/mpower>, accessed 18 April 2022).
- 60 Egypt to host COP27 international climate conference in 2022 – ministry. In: Reuters [website]. London: Reuters; 2021 (<https://www.reuters.com/business/cop/egypt-host-cop27-international-climate-conference-2022-ministry-2021-11-11/>, accessed 18 April 2022).

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