



Environmental impacts of the tobacco industry

– a survey of the
research situation in

2020



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For a smoke-free environment

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Introduction

In 2019, VISIR published a critical survey of the environmental impacts of the tobacco industry based on the current state of research. The survey attracted considerable attention, for example among those working with reducing the use of tobacco and related issues. Since, then some sectors of the tobacco industry have been keen to position themselves as active in reducing the negative environmental impact they cause. Most notable is perhaps Philip Morris' collaboration with the organization Håll Sverige Rent (Keep Sweden Tidy), aimed at eradicating cigarette butts from streets and other public areas¹. One result of this collaboration is the website Fimpa Rätt (lit. stub it out correctly)², which spreads information about the range of problems caused by tossing a cigarette butt on the street. All attempts by tobacco companies to reduce their impact on the environment are of course welcome. However, in the case of cigarette butts, an investigation in 2020 into the kinds of litter dumped in Sweden's cities found that the number of discarded butts had not decreased. It must be stressed that tobacco companies only address a few of their environmental impacts. Deforestation, impoverishment of agricultural land and impacts on biological diversity are neither mentioned nor addressed. This strategy is not unique to Sweden but is general praxis, as shown by researchers at the University of Bath in their "Tobacco Tactics"³.

Some additional research has been published since the release of the 2019 VISIR survey, which is updated here, but still based mainly on WHO's important report *Tobacco and its environmental impact: an overview*⁴, where

Deputy Director General Oleg Chestnov observes in the preface that although most people are aware of the negative health impacts of smoking, the other negative impacts of the tobacco industry are mostly unknown, despite the fact that the tobacco industry has adverse effects on almost all UN sustainable development goals⁵. Chestnov emphasizes that tobacco consumption cannot be seen as an individual health problem, but rather as a problem for the entire planet. By clarifying the tobacco industry's adverse impact on the environment and climate, new groups might be persuaded to avoid smoking, and more smokers motivated to quit. WHO therefore highlights the negative consequences of smoking beyond the perspective of public health⁶.

How this approach works in practice can be shown, for example by the Health Adventure Centre (Hälso-äventyret) in Knivsta, where it has been observed that young people tend to focus more on the environmental effects of tobacco than its health effects⁷. Primary school sixth-graders are the target group in this project, which draws on aspects of ecology rather than health as an introduction to the information provided. On entering the display area, the children find themselves in a room filled with rainforest sounds and are asked the question: what has this to do with tobacco? An evaluation of this project showed that deforestation and the extinction of animals aroused stronger feelings than threats to one's own health, in children at an age when it is difficult to fully grasp the concept of even one's own mortality. After visiting the Health Adventure Centre, the children are asked to describe in writing what they have learnt or observed and they often emphasize the impact of tobacco on the environment. The association A Non-Smoking Generation also highlights the environmental impact

1 <https://www.expressen.se/kvallsposten/debatt-kvp/rokarna-behover-produkter-som-inte-kastas-pa-marken/>

2 <https://www.fimparatt.se/>

3 <https://tobaccotactics.org/wiki/greenwashing/>

4 <http://apps.who.int/iris/bitstream/handle/10665/255574/9789241512497-eng.pdf;jsessionid=5AA614647C8E472620BE47A4BDF79244?sequence=1>

5 http://www.tobaksfakta.se/tobak_ett_hot_mot_hallbar_utveckling/

6 <http://www.who.int/campaigns/no-tobacco-day/2017/event/en/>

7 Interview with Malin Sohlberg, health educator, Hälso-äventyret Knivsta, malin.sohlberg@regionuppsala.se

of tobacco, for example in their lecture “Tobaksbarn” (Tobacco Children)⁸.

However, the adverse environmental impacts of tobacco should not be presented as supplementary information relative to the health risks of tobacco. Health risks should rather be presented as one of the many adverse effects of the tobacco industry. Through this broader perspective, snus, e-liquid and other nicotine products become more naturally included in the discussion, and the Swedish tobacco industry’s argument justifying the use of snus by proclaiming that it is healthier than cigarettes loses relevance.

In October 2018, WHO published the report *Cigarette smoking – An assessment of tobacco’s global environmental footprint across its entire supply chain, and policy strategies to reduce it*, compiled by researchers at Imperial College London⁹. The same authors have also recently published their conclusions in the scientific journal *Environmental Science and Technology*¹⁰. These researchers have developed a model for calculating the tobacco industry’s resource use and emissions over the entire life-cycle of the cigarette, which constitutes 90 % of all tobacco products¹¹. It is noted that the negative environmental impact of tobacco comes into play in all spheres of its manufacture and use, from cultivation to the cigarette butt in the street. Tobacco cultivation destroys agricultural land and leads to deforestation. The curing of tobacco causes carbon-dioxide emissions and further deforestation. The manufacturing of cigarettes creates large amounts of hazardous waste, and transportation further impacts on the climate. Smoking itself causes air pollution, and the widespread litter of cigarette-butts emits large amounts of environmental toxins and plastics. While at the same time, we are gradually impacting adversely on our own living conditions through a lifestyle that consumes more resources than nature is able to provide, globally.

Earth Overshoot Day marks the day each year when WHO estimates that we have exhausted the earth’s annual production of resources. In 2019, Earth Overshoot Day occurred earlier than ever before – already on July 29¹². The 2020 pandemic, that has seen a

reduction in travel and to a lesser degree in consumption, does not alter the conclusions in the WHO report, that in order to meet the UN’s sustainability goals, we must implement fundamental changes in our consumption and production patterns, including quitting smoking completely¹³! The pandemic has not had any positive effect on tobacco consumption. On the contrary, Swedish Match’s stock price rose sharply in 2020, almost doubling between August 2019 and August 2020¹⁴, and, despite WHO’s efforts, the number of people using tobacco decreased only marginally during the 2000s, from 1,397 billion in 2000 to 1,337 billion in 2018¹⁵. In terms of tobacco production, there was an initial increase in 2016 compared to the previous ten years, followed by a slight decrease¹⁶.

In October 2018, the Swedish Patent and Market Court ruled that the tobacco company Skruf, which is owned by the Imperial Tobacco Group, one of the world’s largest tobacco companies, may not continue to use the terms “Eko” and “ekologisk tobak” (Eco and ecological/ organic tobacco) on signs, snus coolers or displays inside outlets¹⁷. The court argued that the average consumer could perceive “Eko” and “ekologisk” as an indication that the products encompassed health and/or environmental benefits (in Swedish, the term “ekologisk” is used for organic and/or ecological, depending on context). KO, the Swedish Consumer Ombudsman, had initiated the case in 2017 by suing Skruf for the incorrect marketing of snus. This was a consequence of a previous assessment by the Swedish Consumer Agency that the marketing content was not compatible with the legal ban on marketing tobacco products in any way that suggests benefits to health or the environment¹⁸. In its lawsuit, KO also demanded a general ban on texts that imply that a tobacco product is “ekologisk”. This was, however, not approved by the court.

The fact that tobacco companies try to gain a share of the market by targeting products at

8 <https://tobaksbarn.se/>

9 <http://www.who.int/fctc/mediacentre/news/cop8/environment-launch-publication/en/>

10 Zafeiridou, M, Hopkinson, N S, Voulvouli, N, Cigarette Smoking: An assessment of tobacco’s global environmental footprint across its entire supply chain, 2018. <https://pubs.acs.org/doi/10.1021/acs.est.8b01533>

11 Zafeiridou, M, Hopkinson, N S, Voulvouli, N, Supporting information Cigarette Smoking: An assessment of tobacco’s global environmental footprint across its entire supply chain, 2018. https://pubs.acs.org/doi/suppl/10.1021/acs.est.8b01533/suppl_file/es8b01533_si_001.pdf

12 <https://www.overshootday.org/newsroom/press-release-june-2019-english/>

13 “The environmental damage that tobacco causes, on top of its negative health, social and economic impacts, makes it incompatible with the global development agenda. Reducing and ultimately eliminating cigarette production and consumption should be an integral part of strategies to achieve the Sustainable Development Goals (SDGs) (including goals 12, 13, 14, and 15).” Page 3 <http://www.who.int/fctc/publications/WHO-FCTC-Enviroment-Cigarette-smoking.pdf?ua=1&ua=1>

14 <https://www.avanza.se/aktier/om-aktien.html/5266/swedish-match>

15 <https://www.who.int/news/item/19-12-2019-who-launches-new-report-on-global-tobacco-use-trends>

16 <https://www.statista.com/statistics/261189/global-tobacco-production-since-1980/>

17 <http://www.dagensjuridik.se/2018/10/ekologiskt-snus-far-inte-marknadsforas-som-ekologiskt-kan-uppmanna-till-tobaksbruk>

18 Tobakslagen 9a § Märkningen på förpackningar till tobaksvärer eller på själva tobaksväran får inte heller 1. antyda att en viss tobaksvär har miljöfördelar,



Photo from www.pexels.com.

environmentally conscious consumers¹⁹ has of course advantages. One example is the reduction in pesticides in tobacco cultivation. However, this can also be seen as “greenwashing”²⁰, since there is no such thing as environmentally friendly tobacco. The multinational tobacco companies seem to compete on their websites and annual reports over the importance of sustainability to their company.

Some examples. Imperial Tobacco writes on their website that their ISO 14001 certification has given them an overview of their own environmental impact, and they highlight their efforts to switch to renewable electricity such as wind power and solar cells²¹. Japan Tobacco International writes on their website²² that they have scrutinized all parts of their business, large and small, in order to reduce their environmental impact. They stress that the climate issue is not only one of the biggest challenges for the world, but also a threat to their own business, since climate change threatens the tobacco crop. Their sustainability report for 2017 highlights their Jordan factory as the first in the world to use solar energy for both processing

and the regulation of heating/cooling of facilities²³. British American Tobacco writes in their sustainability report for 2019 that they have reduced carbon dioxide emissions by 9.5 % in two years, and that they aim to use at least 30 percent renewable energy in their own business by 2025²⁴.

The reader of these sustainability reports might easily get the impression that these companies take climate issues seriously. Obviously, they are making investments to reduce carbon dioxide emissions arising from the actual manufacturing of tobacco products, which is positive. However, there is a big gap between reality and the image presented. An important task is therefore to supplement the tobacco companies’ self-images with facts about the environmental impacts that these companies do *not* report.

The present survey of the environmental impact of tobacco is based on the above-mentioned reports by WHO and complemented with research that these reports only touch on, such as the tobacco industry’s use of animal experiments. Those sections of the WHO reports that deal with social and economic sustainability goals will not be addressed here.

19 <http://ekologiskshopping.se/tag/ekologiskt-odlad-tobak/>

20 <https://searchcrm.techttarget.com/definition/greenwashing>

21 <https://www.imperialbrandsplc.com/sustainability/approach/reducing-environmental-impact.html#>

22 <https://www.jti.com/about-us/sustainability/we-are-serious-about-protecting-the-environment>

23 https://www.jti.com/sites/default/files/global-files/documents/related-documents/JT_Group_Sustainability_Report_FY2017_web.pdf

24 [https://www.bat.com/group/sites/UK_9D9KCY.nsf/vwPagesWebLive/DOAWWEKR/\\$file/BAT_Sustainability_Strategy_Report_2019.pdf](https://www.bat.com/group/sites/UK_9D9KCY.nsf/vwPagesWebLive/DOAWWEKR/$file/BAT_Sustainability_Strategy_Report_2019.pdf)



Tobacco cultivation occupies large areas and destroys agricultural land through the erosion it causes. Photo: Adobe Stock (Champ de tabac av Francis).

Tobacco cultivation – an efficient way of destroying agricultural land

One environmental consequence of the tobacco industry, and perhaps the easiest to grasp, is the extensive land-use required for tobacco cultivation. A number of countries with large-scale tobacco cultivation are also poor countries, with an insufficient food supply, and therefore in great need of additional arable land for food production. The problem is not only the large size of the areas occupied for the cultivation of tobacco, but also the fact that the cultivation of tobacco literally destroys agricultural land, for example through the erosion it causes. A study from Tanzania shows that only 25 % of tobacco growers use the same land to grow tobacco two years in a row, while 69 % instead use new virgin forestland every year²⁵.

The total area globally that is actively used to grow tobacco has decreased in recent years, to approximately 3.4 million hectares in 2019²⁶. This is still more than Sweden's approximately 2.5 million hectares of total

arable land²⁷. To this must be added the area required by other sectors of the tobacco industry. The report *Cigarette smoking – An assessment of tobacco's global environmental footprint across its entire supply chain, and policy strategies to reduce it* estimates that the total land area used amounts to 5.3 million hectares²⁸, when one includes the land required for the firewood used in curing and for the tobacco industry's approximately 500 factory facilities globally. This corresponds to almost 17 times the area of the Swedish island of Gotland! Of this total area, an estimated 0.2 million hectares is urban land, the remainder, agricultural land or forest.

Approximately 90 % of the world's tobacco cultivation takes place in low-income countries²⁹. In terms of volume, China, Brazil and India are the largest producers, but in 7 of the 25 countries with the largest production of tobacco: Laos, Mozambique, Zambia, North Korea, Zimbabwe, Tanzania and Malawi, the malnutrition rate in the population is 20 % or higher³⁰.

According to the UN report *The State of Food Security and Nutrition in the World 2020*, the number of malnourished people in the world has increased in recent years, reaching an estimated 690 million people in 2019,

25 Sauer, J. & Abdallah, J. (2007) Forest diversity, tobacco production and resource management in Tanzania. *Forest Policy and Economics*. 9 (5), 421–439. <http://dx.doi.org/10.1016/j.fopol.2005.10.007>

26 <https://www.statista.com/statistics/261192/global-area-of-harvested-tobacco-since-1980/>

27 <https://jordbruketisiffror.wordpress.com/2015/06/11/arealen-akermark-minskar-stadigt/>

28 <http://www.who.int/fctc/publications/WHO-FCTC-Enviroment-Cigarette-smoking.pdf?ua=1&ua=1>

29 Cairney P, Studlar DT, Mamudu HM. Global Tobak Control: Power, Policy, Governance and Transfer, Springer, 2011.

30 <https://tobaccoatlas.org/topic/growing/>

which corresponds to 8.9 % of the world's population³¹. That is approximately 60 million more than in 2014.

In Malawi, at least 2.5 million people, including 1.5 million children, were struck by an acute famine in 2016³². As shown by A Non Smoking Generation in the report *Den stora tobakslögnen (The great tobacco lie)*, tobacco cultivation was a contributing factor to the situation in Malawi³³. In 2010, 195 km² of the country's total area of 118,484 km² was used for tobacco cultivation. Malawi is the country with the highest share of its own arable land devoted to tobacco cultivation, in the world.

If the world's tobacco plantations were instead used for food production, they could feed 20 million people.³⁴ The claim, that more people would be fed if tobacco growers switched to growing food, is not based on theoretical calculations alone. A 2017 study conducted by the World Bank in Indonesia, a country with the world's fifth largest tobacco production, showed that those who abandoned tobacco cultivation to instead grow food, increased their income by more than 30 %, while at the same time reducing their working time and health risks³⁵. In their study, the World Bank also emphasizes that research has shown that job losses in the tobacco sector are usually compensated by jobs in other sectors. A study published in 2020 regarding the situation for tobacco growers in Zimbabwe³⁶, the major tobacco producer in Africa and the sixth largest tobacco producer in the world, shows that more than half of the tobacco growers are trapped in financial debt to the tobacco companies. Tobacco growing has not yielded any financial security for these growers, instead it has forced them into dependence on the tobacco companies. The report concludes that growers have not benefited at all after switching over to tobacco cultivation.

A contributing factor to the soil destruction caused by tobacco cultivation is that crop rotation is seldom applied. This causes the soil to become vulnerable to a variety of pests and diseases, which in turn leads to an extensive use of pesticides³⁷. Tobacco plants require a lot of nitrogen, phosphorus and potassium, which

leads to soil depletion and the need for large amounts of fertilizers³⁸. To compensate for this soil destruction, new land is constantly being exploited. The fact that tobacco cultivation in itself kills the organisms that are needed for the soil to maintain its fertility further aggravates the problem³⁹. Plant roots interact with different types of soil organisms such as bacteria, fungi and small animals. Reduced diversity of these organisms leads to reduced soil fertility⁴⁰.

One agricultural method for obtaining high nicotine levels is the removal of leaves from the plant⁴¹. This stimulates root growth and leads to a faster uptake of nutrients from the soil⁴². The method causes particularly large problems where soils already naturally contain low amounts of nutrients, e.g. in the tropics.

Soil erosion occurs in areas where the soil is poorly protected from wind and water. Tobacco is usually grown in a way that does not protect the soil layer, and consequently desertification by tobacco cultivation has been observed in several countries, including Tanzania⁴³, Jordan⁴⁴, India⁴⁵, Cuba⁴⁶, and Brazil⁴⁷. In the arid areas of India, tobacco growing has been found to be responsible for the most serious erosion problems⁴⁸.

Tobacco cultivation is estimated to cause a loss of 45 kg topsoil per hectare and year (India). This can be compared to cotton cultivation that causes a loss of 7.5 kg, and grape cultivation 11 kg. Not only is the loss much larger, but tobacco also causes greater nutrient depletion compared to other crops⁴⁹:

38 Golden leaf barren harvest, the costs of tobacco farming. Technical report, Washington DC: Campaign for Tobacco Free Kids: 2001

39 <https://tobaccocontrol.bmj.com/content/tobaccocontrol/21/2/191.full.pdf?ua=1>

40 <https://lantbruksnytt.com/organismer-jorden-vaxter/>

41 Geist H. Soil mining and societal responses: the case of tobacco in eastern Miombo Highlands. In: Lohnert B, Geist H (eds). *Coping with changing environments: social dimensions of endangered ecosystems in the developing world* (chapter 5). Aldershot, UK & Brookfield, VT: Ashgate; 1999, pages 119–148.

42 http://tobaksbarn.se/content/uploads/Artikel---Tobak-och-miljön_130904.pdf

43 <https://tobaccocontrol.bmj.com/content/8/1/18>

44 Khresat SA, Rawajfih Z, Mohammad M. Land degradation in north-western Jordan: causes and processes. *Journal of Arid Environments*. 1998;39(4):623–629.

45 Reddy K and Gupta P. Report on tobacco control in India. Technical Report New Delhi: Government of India; 2001;142.

46 Schietecatte W, Cornelis WM, Acosta ML, Leal Z, Lauwers N, Almoza Y, et al. Influence of landuse on soil erosion risk in the cuyaguateje watershed (Cuba). *Catena*. 2008;74(1):1–12.

47 Geist HJ, Chang K, Erges V, Abdallah JM. Tobacco growers at the crossroads – towards a comparison of diversification and ecosystem impacts. *Land Use Policy*. 2009;26(4):1066–1079.

48 Reddy K and Gupta P. Report on tobacco control in India. Technical Report New Delhi: Government of India; 2001;142

49 Reddy K and Gupta P. Report on tobacco control in India http://www.who.int/fctc/reporting/Annex6_Report_on_Tobacco_Control_in_India_2004.pdf (sida 143)

31 http://www.fao.org/3/ca9692en/online/ca9692en.html#chapter-executive_summary

32 <https://manniskohjalp.se/malawi2016>

33 <http://www.nonsmoking.se/wp-content/uploads/2018/06/rapport.pdf>

34 <http://www.tobaksfakta.se/sa-hindrar-tobaken-hallbar-utveckling-i-varlden/>

35 *The Economics Of Tobacco Taxation And Employment In Indonesia. Health, Population, and Nutrition Global Practice*. <http://documents.worldbank.org/curated/en/919961507699751298/pdf/120352-WP-P154568-10-10-2017-10-19-0-WBGIIndoEmploymentFINALweb.pdf>

36 <https://tobaccocontrol.bmj.com/content/early/2020/08/25/tobaccocontrol-2020-055825>

37 Lecours N, Almeida GEG, Abdallah JM, Novotny TE. Environmental health impacts of tobacco farming: a review of the literature. *Tobacco Control*. 2012;21(2):191–196.

Crop	Nitrogen	Phosphorous	Potassium (loss in kg/ha - Africa)
Tobacco	24,4	15,0	9,8
Coffee	2,2	14,4	2,5
Maize	1,9	6,7	1,9

Tobacco farming in areas where the plants need more water than is supplied by rain or irrigation also leads to lower groundwater levels, which impacts on all farming in the area⁵⁰. A study from Sri Lanka showed that after six to eight years of tobacco growing, grain production in the area had deteriorated by about 30 %⁵¹.

In conclusion, tobacco cultivation not only appropriates large land areas, but also constantly demands new land, since cultivation conditions in previously employed land will have deteriorated owing to erosion, lowered groundwater levels, depletion of nutrients, and loss of important soil organisms.

The effects of growing a poison with the help of other poisons

Aldrin, Dieldrin and DDT are examples of the pesticides used in tobacco growing in low-wage countries. These products are so harmful to both the environment and growers' health that they have been banned in the EU and in some other countries⁵². They are also often used without the necessary protective equipment, which further increases the health risks⁵³. Tobacco companies encourage the use of pesticides. For example, British American Tobacco instructed growers in Kenya to use pesticides on 16 occasions during the three months that the plants were sprouting⁵⁴.

In 2012, Argentinian tobacco growers sued the companies Philip Morris and Monsanto⁵⁵ for diseases caused by pesticide use⁵⁶. Philip Morris was sued for requiring the use of Roundup in its tobacco plantations, and Monsanto for selling Roundup without risk warnings⁵⁷. In the lawsuit, the growers describe how

50 ibid.

51 Gunatilake Hearn. Institutional aspects of soil conservation in tobacco lands and factors influencing tobacco farmer's soil conservation—decisions in the Hanguranketha-Walpane area, Sri Lanka, 1990 (Thesis). University of Norway, White, Roger, et al. (1995) Land use changes in upper Mahaweli catchment Sri Lanka Forester—remote sensing, Colombo: Colombo Press.

52 http://www.who.int/fctc/reporting/Annex6_Report_on_Tobacco_Control_in_India_2004.pdf

53 Arcury T, Quandt S. Health and social impacts of tobacco production. Journal of Agromedicine. 2006;11:71–81.

54 <http://www.riskbruk.se/?id=8667>

55 The name Monsanto is no longer used by the new owner, Bayer: <https://www.theguardian.com/business/2018/jun/04/monsanto-to-ditch-its-infamous-name-after-sale-to-bayer>

56 <https://www.courthousenews.com/Monsanto-and-Big-Tobacco-Blamed-for-Birth-Defects/>

57 <https://www.organicconsumers.org/blog/monsanto-roundup-gmos-argentina>

the pesticides caused many of their children to suffer from brain and spinal cord malformations, blindness, metabolic diseases, Down's syndrome and epilepsy. The growers also point out that the pesticides have poisoned their other crops, their water wells and the surrounding waterways⁵⁸. The legal process is not yet completed. However, in 2018 a similar case ended with Monsanto being ordered to pay 289 million dollars to a worker who contracted blood cancer after using the pesticide Ranger Pro (similar to Roundup) without being warned by Monsanto of the risks⁵⁹. Furthermore, a 2019 case in California⁶⁰, ended with Monsanto being sentenced to pay more than \$ 2 billion to a couple who contracted cancer after using Roundup.

The active ingredient in Ranger Pro and Roundup is glyphosate. Glyphosate is dangerous for aquatic organisms, and according to IARC, the WHO's special cancer research unit, it is probably also carcinogenic. In Sweden it is forbidden to spray glyphosate on crops during the growing season and Austria was first in the EU to ban glyphosate completely⁶¹. Germany and Luxemburg have also decided to ban glyphosate⁶².

An example of a pesticide that has long been banned in many countries but is still used on tobacco plantations is dichlorodiphenyltrichloroethane (DDT)⁶³. DDT is a so-called persistent environmental toxin, which means that it can remain in the environment for a long time, since it is chemically stable. It is also fat-soluble and can spread to places far from where it was released. It negatively affects the general and reproductive health of both humans and animals. This is partly because DDT is structurally similar to sex hormones. A relatively high dose of DDT is required for acute symptoms to occur, but even very small amounts of DDT can have various long-term effects in humans, such as impaired learning and reproductive ability⁶⁴. However, it was the effects on ecosystems that sparked the debate about DDT in the 1960s. In Sweden, the use of DDT contributed to the near-extinction of the white-tailed eagle⁶⁵, as a result of the poison accumulating higher up in the food chain.

58 <http://files.courthousenews.com/2012/04/10/Argentina.pdf>

59 <https://www.svd.se/miljarddom-mot-monsanto>

60 <https://www.landlantbruk.se/lantbruk/ny-miljarddom-om-skadestand-mot-monsanto/>

61 <https://svenska.yle.fi/artikel/2019/07/30/om-tre-ar-ska-vaxtgifter-glyfosat-forbjudas-i-hela-eu-men-inga-forberedelser-gors>

62 <https://landetsfria.nu/2019/nummer-53/luxemburg-tredje-eu-landet-art-forbjuda-glyfosat/>

63 Arcury T, Quandt S. Health and social impacts of tobacco production. Journal of Agromedicine. 2006;11:71–81.

64 <http://files.webb.uu.se/uploader/271/VT12-34-Carlsson-Ylva-sammanfattnings.pdf>

65 <http://files.webb.uu.se/uploader/271/VT11-01-Asker-Ingrid-uppsats.pdf>



Approximately 1,3 million children under the age of 14 are working in the tobacco-industry, globally. Photo: Human Rights Watch.

In the US, Sweden, and many other West European countries, DDT was banned in the 1970s⁶⁶. Despite this, both DDT and other pesticides are often sold in bulk to tobacco growers without instructions, leaving farmers largely unaware of their toxicity⁶⁷. Chronic exposure to these pesticides can lead to birth defects, cancer, blood diseases, or neurological and endocrine disorders. Studies show that even those tobacco workers who do not work directly with pesticides, such as harvesters, are vulnerable to pesticide poisoning. In Kenya, for example, 26 % of the tobacco workers showed symptoms of pesticide poisoning according to a study in the year 2000⁶⁸, and in Malaysia one third of the tobacco workers showed two or more symptoms, according to a 2005 study⁶⁹. Other studies have shown that tobacco growers working directly with pesticide spraying also are at increased risk of neurological and

mental illnesses⁷⁰, such as anxiety, depression and suicidal thoughts. A 2003 study in Brazil showed that mental illness decreased three months after tobacco growers stopped using pesticides⁷¹.

Some of the most common pesticides used in tobacco cultivation and their health effects⁷²:

Aldicarb – One of the most toxic pesticides. Even small doses are directly fatal to humans. Causes chronic damage to the nervous system, weakens the immune system and damages the genome.

Chlorpyrifos – Causes chronic damage to the nervous system, impairs memory capacity and causes depression.

Acefat – Carcinogenic and directly toxic when inhaled or upon skin contact.

Monocrotophos – Affects the nervous system and causes speech difficulties and impaired reflexes.

Imidakloprid – May cause breathing difficulties and impaired mobility.

Thiamethoxam – Carcinogenic.

66 <http://kemikaliekollen.blogspot.com/2013/01/ddt-ett-forbjudet-bekampningsmedel.html>

67 Damalas CA, Georgiou EB, Theodorou MG. Pesticide use and safety practices among Greek tobacco farmers: a survey. International Journal of Environmental Health Research. 2006;16(5):339–348.

68 Ohayo-Mitoko GJ, Kromhout H, Simwa JM, Boleij JSM, Heederik D. Self-reported symptoms and inhibition of acetylcholinesterase activity among Kenyan agricultural workers. Occupational and Environmental Medicine. 2000;57(3):195–2000

69 Kimura K, Yokoyama K, Nordin RB, Naing L, Kimura S, Okabe S, et al. Effects of pesticides on the peripheral and central nervous system in tobacco farmers in Malaysia. Industrial Health. 2005;43(2):285–294

70 Kimura K, Yokoyama K, Nordin RB, Naing L, Kimura S, Okabe S, et al. Effects of pesticides on the peripheral and central nervous system in tobacco farmers in Malaysia. Industrial Health. 2005;43(2):285–294

71 Salvi RM, Lara DR, Ghisolfi ES, Portela LV, Dias RD, Souza DO. Neuropsychiatric evaluation in subjects chronically exposed to organophosphate pesticides. Toxicological Sciences. 2003;72(2):267–271 <https://academic.oup.com/toxsci/article/72/2/267/1691274/Neuropsychiatric-Evaluation-in-Subjects>

72 http://www.who.int/fctc/reporting/Annex6_Report_on_Tobacco_Control_in_India_2004.pdf (sida 145)



Photo from www.pexels.com.

For tobacco growers, however, pesticides are not the only health problem, so too is the handling of the toxic tobacco plant itself⁷³. "Green Tobacco Sickness (GTS)" develops when the skin is exposed to the nicotine in tobacco leaves, especially when wet. Symptoms include weakness, headache, nausea, vomiting, dizziness, stomach cramps, breathing difficulties, diarrhea, chills, fluctuations in blood pressure or heart rate, and increased sweating⁷⁴.

A 2005 study in the US showed that children and young people who worked with tobacco cultivation were particularly vulnerable⁷⁵. Possible explanations were the children's smaller body size in relation to the amounts of nicotine they were exposed to, less knowledge about the risks of handling wet tobacco, and less smoking-induced tolerance to nicotine.

The children's rights organization Plan International estimates that children working on tobacco farms in Malawi receive nicotine levels equivalent to smoking 50 cigarettes/day⁷⁶. According to the United Nations International Labor Organization (ILO), around 1.3 million children below the age of 14 worked in the tobacco industry in 2011⁷⁷, and a study published by The Guardian in June 2018 showed that

child labor in the tobacco industry was increasing in countries such as Argentina, India and Zimbabwe⁷⁸.

The use of pesticides not only causes health problems among tobacco growers, but also affects the ecosystem, e.g. by polluting our waters⁷⁹. A study showed that pesticides used in tobacco growing in Bangladesh caused fish deaths and the elimination of important soil organisms⁸⁰. Pesticides can also cause problems by creating resistance. For example, extensive DDT use in tobacco cultivation in India may have developed DDT-resistant malaria mosquitos⁸¹.

Pesticides also reach the tobacco consumer. Cigarette smoke contains trace amounts of at least three pesticides: flumetralin, pendimethalin and trifluralin⁸². Snus has

78 <https://www.theguardian.com/world/2018/jun/25/revealed-child-labor-rampant-in-tobacco-industry>

79 http://www.who.int/fctc/reporting/Annex6_Report_on_Tobacco_Control_in_India_2004.pdf

80 Akhter F, Mazhar F, Sobhan MA, Baral P, Shimu S, Das S, et al. From tobacco to food production: Assessing constraints and transition strategies in Bangladesh. Final Technical Report Submitted to the Research for International Tobacco Control (RITC) Program of the International Development Research Centre (IDRC). Ontario, Canada: International Development Research Centre; 2008 <https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/50834/IDL-50834.pdf>

81 Chapin G, Wasserstrom R. Pesticide use and malaria resurgence in Central America and India. Social Science and Medicine 1983;17:273–87.

82 Dane AJ, Crystal DH, Kent JV. The detection of nitro pesticides in mainstream and sidestream cigarette smoke using electron monochromator-mass spectrometry. Anal Chem. 2006;78:3227–33.

73 <https://tobaccocontrol.bmjjournals.org/content/21/2/191>

74 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5868082/>

75 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1497768/>

76 <https://drugnews.nu/2009/08/24/5367/>

77 <https://omni.se/barnarbetet-med-tobak-okar-ville-blisjukskoterska/a/OnAlnO>

also been shown to contain residual pesticides⁸³, and in 2014 the European Food Safety Authority reported direct consumer exposure to residual chemicals such as flumetralin and trifluoroacetic acid⁸⁴.

In summary, the extensive use of pesticides in tobacco cultivation leads to health problems for tobacco growers, to negative effects on the ecosystems, and to pesticide residues also reaching consumers. However, tobacco cultivation without the use of pesticides is not free from toxic substances, since nicotine is a poison that can cause those who work in tobacco cultivation to develop green tobacco disease through exposure. To grow tobacco is literally to grow poison. Nicotine can itself actually be used as a pesticide⁸⁵.

Smoking not only kills – smoking eradicates

The tobacco industry causes deforestation in many ways. According to a report from the World Bank in 2007, tobacco cultivation is the cause of 38 % of the total deforestation effects of tobacco production, while the need for timber in the curing process accounts for another 42 %, the need for paper for packages and for cigarettes accounts for 12 %, and the remaining 8 % are the effects of growers abandoning former land to break new forestland⁸⁶.

Deforestation means cutting down and burning forests at such a rate that regrowth does not occur⁸⁷. Since 1990, 420 million hectares of forest have disappeared⁸⁸. One of the consequences of deforestation is a reduction of biodiversity. “Biodiversity” refers to the individual genetic variations within species, the variations between different species, and the variations between different habitat types and landscapes. The term is used to emphasize the importance of a rich diversity. To obtain food, clean water and clean air, we must preserve all the different ecological processes that we depend on, such as photosynthesis in green plants, decomposition in the soil, pollination of our crops, and water regulation in

the forest landscape⁸⁹. Deforestation and agriculture have caused the greatest reduction of biodiversity since the 15th century⁹⁰, although climate change poses an even greater threat in the future.

The World Wildlife Fund (WWF) Living Planet 2020 report⁹¹, shows that since 1970, more than two thirds of the world's populations of mammals, fish, birds, amphibians and reptiles have disappeared. The tropics are worst hit, the biggest threats being loss of habitat and overexploitation, e.g. in the form of deforestation. The reduction of biodiversity is also hitting people, and the UN's Head of Biodiversity, Elizabeth Maruma Mrema, emphasizes that the situation is urgent⁹².

The fact that tobacco production has caused a reduction of biodiversity is not only a statistical calculation, but has been evidenced by various field studies in Argentina⁹³, Bangladesh⁹⁴, Brazil⁹⁵, Cambodia⁹⁶, Ghana⁹⁷, Honduras⁹⁸, Kenya⁹⁹, Malawi¹⁰⁰,

89 <https://www.slu.se/centrumbildningar-och-projekt/centrum-for-biologisk-mangfald-cbm/biologisk-mangfald/>

90 Maxwell, Sean L, Fuller, Richard A, Brooks, Thomas M, & Watson, James E.M., Biodiversity: The ravages of guns, nets and bulldozers <https://www.nature.com/news/biodiversity-the-ravages-of-guns-nets-and-bulldozers-1.20381>

91 <https://livingplanet.panda.org/>

92 <https://www.cbd.int/doc/speech/2020/sp-2020-02-24-wg2020-2-en.pdf>

93 Cáceres D. Agrobiodiversity and technology in resource-poor farms. *Interciencia*. 2005;31(6):403–410 <http://www.redalyc.org/pdf/339/33911703.pdf>

94 Motaleb MA, Irfanullah HM. Tobacco cultivation in Bangladesh: Is it a threat to traditional agro-practice? *Indian Journal of Traditional Knowledge*. 2011;10(3):481–485 http://sa.indiaenvironmentportal.org.in/files/file/Tobacco%20cultivation_0.pdf

95 Moreno-Penárranda R, Kallis G. A co-evolutionary understanding of agro-environmental change: a case-study of a rural community in Brazil. *Ecological Economics*. 2010;69(4):770–778.

96 Lecours N. Tobacco control and tobacco farming: separating myth from reality. In: Leppan W, Lecours N, Buckles D. The harsh realities of tobacco farming in low- and middle-income countries: a review of socioeconomic, health and environmental impacts. London: Anthem Press; 2014:99–137 <https://www.idrc.ca/en/book/tobacco-control-and-tobacco-farming-separating-myth-reality>

97 Leach M, Fairhead J. Challenging neo-Malthusian deforestation analyses in west Africa's dynamic forest landscapes. *Population and Development Review*. 2000;26(1):17–43.

98 Loker WM. The rise and fall of flue-cured tobacco in the Copán valley and its environmental and social consequences. *Human Ecology*. 2005;33(3):299–327.

99 Lecours N. Tobacco control and tobacco farming: separating myth from reality. In: Leppan W, Lecours N, Buckles D. The harsh realities of tobacco farming in low- and middle-income countries: a review of socioeconomic, health and environmental impacts. London: Anthem Press; 2014:99–137 <https://www.idrc.ca/en/book/tobacco-control-and-tobacco-farming-separating-myth-reality>

100 Hudak AT, Wessman CA. Deforestation in Mwanza district, Malawi, from 1981 to 1992, as determined from landsat mass imagery. *Applied Geography*. 2000;20:155–175 https://www.researchgate.net/publication/222829551_Deforestation_in_Mwanza_District_Malawi_from_1981_to_1992_as_determined_from_Landsat_MSS_imagery

83 <http://www.tobaksfakta.se/manga-halsofarliga-amenen-i-snus/>

84 European Food Safety Authority. Conclusion on the peer review of the pesticide risk assessment of the active substance flumetralin. EFSA Journal. 2014;12(12):3912 <http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3912/epdf>

85 <https://www.acs.org/content/acs/en/pressroom/presspac/2010/acs-presspac-october-27-2010/tobacco-and-its-evil-cousin-nicotine-are-good-as-a-pesticide.html>

86 World Bank. Causes and consequences of tropical deforestation. World Bank Report. Washington DC: Environmentally Sustainable Development Division; <http://documents.worldbank.org/curated/en/223221468320336327/pdf/367890Loggerheads0Report.pdf>

87 <https://www.ne.se/uppslagsverk/encyklopedi/lång/avskogning>

88 http://www.fao.org/3/ca8642en/online/ca8642en.html#chapter-executive_summary

Moçambique¹⁰¹, Tanzania¹⁰², Thailand¹⁰³, Uganda¹⁰⁴, and Zimbabwe¹⁰⁵. Deforestation was not the sole cause for the reduction of biodiversity in the above-mentioned examples. Reduced biodiversity in the agricultural landscape also contributed in, for example, Argentina as did reduced biodiversity in watercourses due to pesticide use in, for example, Bangladesh.

Deforestation stems from the recurrent clearing of forest areas for tobacco cultivation and also from the large amounts of timber needed in the curing process¹⁰⁶. Approximately 11.4 million tonnes of wood are required annually for tobacco curing¹⁰⁷. Firewood from one tree only cures enough tobacco for 300 cigarettes¹⁰⁸. In addition, timber is also required for the production of roll paper and packaging. Many countries, especially in Asia and Africa, have experienced a dearth of timber due to tobacco production, which has accelerated deforestation¹⁰⁹. Tobacco curing is the biggest cause of the demand for wood in Malawi¹¹⁰, Zimbabwe¹¹¹, and the Philippines¹¹², among others.

In total, tobacco production is estimated to cause losses of approximately 200,000 hectares of forest per year, which corresponds to 1.7 % of global deforestation¹¹³. In terms of actual deforestation in tobacco-producing countries, the tobacco industry's share is on average 5 %, but variation is large. In China, where tobacco production leads to the deforestation of about 68,000 hectares/year, the proportion is as high as 18 %. In India, the average deforestation is about 1,700 hectares/year¹¹⁴. In Malawi, tobacco cultivation is the dominant cause of deforestation¹¹⁵, and accounted for as much as 70 % of deforestation in 2008¹¹⁶. In the areas of Africa where tobacco is grown, deforestation is 10 times greater than the African average¹¹⁷.

In conclusion, the tobacco industry contributes in various ways to extensive deforestation and thus also to the reduction of biological diversity. Tobacco cultivation also causes a reduction of biological diversity in the agricultural landscape and in aquatic environments. A switch to non-tobacco crops would reduce the problem. According to studies by WHO on alternatives, tobacco growing has a greater impact on ecosystems than, for example, the cultivation of maize¹¹⁸.

Climate impact at all levels – emissions comparable to those from entire countries

The IPCC (UN International Panel on Climate Change) report from October 2018 states that doubled efforts are needed globally to limit climate change to a temperature increase of 1.5 degrees¹¹⁹. According to the report, there are major differences between limiting the temperature increase to 1.5 degrees instead of 2. With a 2-degree temperature increase, the tropical coral reefs are predicted to disappear completely, twice as many

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- 102 Ntongani WA, Munishi PKT, Mbilinyi BP. Land use changes and conservation threats in the eastern Selousniassa wildlife corridor, Nachingwea, Tanzania. *African Journal of Ecology*. 2010;48(4):880–887.
- 103 Lohmann L. Land, power and forest colonization in Thailand. *Global Ecology & Biogeography Letters*. 1993;3:180–191.
- 104 Obua J, Agea JG, Ogwal JJ. Status of forests in Uganda. *African Journal of Ecology*. 2010;48(4):853–859 <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2028.2010.01217.x/> pdf
- 105 Lown EA, McDaniel PA, Malone RE. Tobacco is “our industry and we must support it”: exploring the potential implications of Zimbabwe’s accession to the Framework Convention on Tobacco Control. *Globalization & Health*. 2016;12(1):2 <https://www.ncbi.nlm.nih.gov/pubmed/26754965>
- 106 Geist H, Lambin E. Proximate causes and underlying driving forces of tropical deforestation. *Bioscience*, 2002;52(2):143–150 <http://www.bioone.org/doi/10.1641/0006-3568%282002%29052%5B0143%3APCAUDF%5D2.0.CO%3B2>
- 107 Geist H. Global assessment of deforestation related to tobacco farming. *Tobacco Control*. 1999;8(1):18–28 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1763929/pdf/v008p00018.pdf>
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- 111 Mazurara U, Mahaso F, Goss M. Response of farmers to technological transfers in the methyl bromide phase-out programme in Zimbabwe – the floating tray system. *African Crop Science Journal*, 2012;20(3):171–177 <http://www.ajol.info/index.php/acsj/article/view/81078/71300>
- 112 Hyman EL. The demands for woodfuels by cottage industries in the province of Ilocos Norte, Philippines. *Energy*. 1984;9(1):1–13.

113 Geist H. Global assessment of deforestation related to tobacco farming. *Tobacco Control*. 1999;8(1):18–28 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1763929/pdf/v008p00018.pdf>

114 Reddy K and Gupta P. Report on tobacco control in India. Technical Report New Delhi: Government of India; 2001;142

115 Lee K, Botero NC, Novotny TE. Manage and mitigate punitive regulatory measures, enhance the corporate image, influence public policy: industry efforts to shape understanding of tobacco-attributable deforestation. *Globalization and Health*. 2016;12(1):55

116 Kägi W, Schmid M. Tobacco and forests – the role of the tobacco industry regarding deforestation, afforestation and reforestation. Technical report, Basel: BSS Economic Consultants; 2010

117 Global forest resources assessment 2005 – progress towards sustainable forest management (fao forestry paper 147). Technical report, Rome: Food and Agriculture Organization; 2005 <http://www.fao.org/docrep/008/a0400e/a0400e00.htm>

118 Study group on economically sustainable alternatives to tobacco growing (in relation to articles 17 and 18 of the convention – provisional agenda item 4.8 (who ftc/cop/3/11). Technical report. Geneva: World Health Organization; 2008 http://apps.who.int/gb/ftc/pdf/cop6/ftc_cop6_12-en.pdf

119 <http://ipcc.ch/report/sr15/>

plants and animals will be affected, and hundreds of millions more people will be exposed to climate effects such as climate-related water shortages. All measures that can be taken to reduce our impact on the climate are therefore important. The tobacco industry plays its part here in many ways; all stages, from deforestation to the curing process to transport, are important.

The climate is changing for many reasons, but since the start of industrialization humans have accelerated climate change enormously through emissions of greenhouse gases such as carbon dioxide¹²⁰. Deforestation accounts for about 20 % of the global climate impact according to WWF¹²¹. The Climate Institute estimates an even higher share: 25 %¹²². The principle is that when an existing forest disappears faster than a new forest emerges, the amount of carbon dioxide in the atmosphere increases, which accelerates the greenhouse effect. A secondary effect is that with climate change, more forest areas become drier, with more and increasingly intense forest fires as a result. Large forest fires emit large amounts of carbon dioxide for an intense short period. Cigarette smoking also constitutes an increased risk of forest fire ignition. An Australian report estimates that some 12 fires per day are caused directly by negligence during smoking¹²³. A 2012 study indicates that approximately 1,000 people are killed and 3,000 injured each year in the United States by fires caused by negligence during smoking¹²⁴. In Sweden, cigarettes cause 50 % of all fatal fires¹²⁵.

Based on WWF's estimate of 20 % for deforestation's contribution to global climate impact (with tobacco production causing 1.7 % thereof, see previous section), tobacco production alone accounts for 0.34 % of humanity's climate impact¹²⁶. This exceeds Sweden's 0.2 % overall climate impact¹²⁷. Regardless of other effects, a global phasing out of tobacco production would therefore have more impact than all possible measures eventually taken by Sweden. This is stated merely by way of comparison, one measure does not exclude the other.

Deforestation impacts include the effects caused by the curing process' consumption of timber from

120 <https://www.smhi.se/kunskapsbanken/klimatforandringar-orsakade-av-manniskan-1.3833>

121 <https://www.wwf.se/wwfs-arbete/skog/problem/klimatforandring/1130644-skogar-och-klimatforandringar>

122 <http://climate.org/deforestation-and-climate-change/>

123 https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Legal_and_Constitutional_Affairs/Fire_safety/Report/c02

124 <https://www.cluecho.com/2012/10/tossing-cigarette-butts-is-negligent-and-a-serious-fire-hazard/>

125 <http://www.boupplysningen.se/cigaretter-orsakar-d%C3%B6dsr%C3%A4nder>

126 1,7 procent av 20 procent är 0,34 procent.

127 <https://www.energiforetagen.se/pressrum/nyheter/2017/oktober/ny-statistik-fortsatt-mycket-laga-klimatutslapp-fran-el-och-fjarrvarme-i-sverige/>

areas that are not being reforested¹²⁸. However, the curing process can also account for a more direct climate impact, if e.g. coal is used. In China, there is a growing trend to use coal instead of wood in the drying of tobacco¹²⁹.

Despite the large environmental and climate impact of tobacco cultivation, Imperial Tobacco believes that the company's largest negative environmental impact is the actual manufacturing process.¹³⁰ Some large companies provide information on their emissions of carbon dioxide equivalents. A carbon dioxide equivalent is the climate impact of a greenhouse gas converted to the corresponding impact from carbon dioxide.¹³¹ One might question, of course, how much this data can be trusted in light of the fact that Philip Morris has been shown to manipulate other types of data, e.g. on hazardous cigarette additives.¹³²

Allowing for this reservation concerning reliability, the following calculation can be made: Philip Morris states that their production causes emissions corresponding to 603,000 tonnes of carbon dioxide equivalents per year (2015),¹³³ which corresponds to approximately 0.66 tonnes per one million cigarettes. If this is a representative emission figure, it means that with the 6,250 billion cigarettes smoked annually¹³⁴, the tobacco industry's total emission of carbon dioxide equivalents is 5,125,000 tonnes, which should be compared to the approximately 50 billion tonnes emitted globally per year. This is hardly an overestimate. In the report *Tobacco and its environmental impact: an overview*¹³⁵, WHO presents a similar calculation but based on British American Tobacco's annual report for 2015. The sum was then 8,760,000 tonnes of carbon dioxide equivalents for the entire industry.

The transport sector is estimated to account for about 14 % of the global climate impact¹³⁶. Of course,

128 <http://www.who.int/fctc/publications/WHO-FCTC-Environment-Cigarette-smoking.pdf?ua=1&ua=1>

129 Geist H. Global assessment of deforestation related to tobacco farming. *Tobacco Control*. 1999;8(1):18–28 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1763929/pdf/v008p00018.pdf>

130 Progress in responsibility. *Corporate Responsibility Review* 2006. Bristol, UK: Imperial Tobacco Group PLC; 2006 <http://www.dea.univrt.it/documenti/Avviso/all/all588372.pdf>

131 <https://www.ekolex.se/definition/koldioxidekvivalent>

132 <https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001145>

133 <https://www.pmi.com/sustainability/pmi-and-the-environment/energy-efficiency-and-carbon-performance>

134 Ng M, Freeman MK, Fleming TD, Robinson M, Dwyer-Lindgren L, Thomson B, et al. Smoking prevalence and cigarette consumption in 187 countries, 1980–2012. *Journal of the American Medical Association*. 2014;311(2): 183–192.

135 <http://apps.who.int/bitstream/handle/10665/255574/9789241512497-eng.pdf;jsessionid=5AA614647C8E472620BE47A4BDF79244?sequence=1>

136 <https://www.wwf.se/wwfs-arbete/klimat/mansklig-paverkan/1124268-mansklig-paverkan-klimat>

the tobacco industry transports goods at several stages in the production process. Diesel-powered trucks are used to a large extent, and air transport is also used. In addition to the climate impact, diesel combustion also causes air pollution. WHO points to air pollution from trucks as one of the main sources of disease-related air pollution¹³⁷. However, few tobacco companies report their emissions from transport separately. Japan Tobacco International is an exception. They estimated the company's 2017 transport-related emissions of carbon dioxide equivalents to be 645,000 tonnes¹³⁸.

Plastic is used in packages, especially of smokeless tobacco such as snus and *gutkha*¹³⁹. In addition to impacting on climate, plastic waste causes many other environmental problems due to the long time that is required for waste degradation¹⁴⁰, especially when the plastic accumulates in the oceans. In India, the use of plastic was banned in all packages/sachets for smokeless tobacco types in 2016¹⁴¹. The actual consumption of tobacco also has a climate impact, since smoking emits carbon dioxide, methane and nitrogen oxides. Methane is a far more powerful greenhouse gas than carbon dioxide, and nitrogen oxides can also have an environmental impact¹⁴². Calculated over a twenty-year life-cycle, methane is 72 times stronger than carbon dioxide as a greenhouse gas.

In the WHO report *Cigarette smoking – An assessment of tobacco's global environmental footprint across its entire supply chain, and policy strategies to reduce it*¹⁴³, the total tobacco industry emissions of carbon dioxide equivalents are estimated at 84 million tonnes, of which 20.8 million tonnes come from cultivation, 44.7 million tonnes from the curing process, and 15.7 million tonnes from manufacturing. This corresponds to 0.168 percent of the world's total emissions¹⁴⁴. This is a significantly greater climate impact than what has emerged from the tobacco industry's own environmental assessments. In terms of the production

137 Pruss-Ustun A, Wolf J, Corvalan C, Bos R, Neira M. Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risk. Technical report. Geneva: World Health Organization; 2016

138 https://www.jt.com/sustainability/report/pdf/2017/JT_Group_Sustainability_Report_FY2017.pdf

139 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4672840/>

140 Pavani P, Raja Rajeswari T. Impact of plastics on environmental pollution. Journal of Chemical and Pharmaceutical Sciences, Special Issue 2014

141 Pallerla SK. Directions under section 5 of the Environment (protection) Act, 1986 regarding implementation of the plastic waste management rules, 2016 by the manufacturers of *gutkha*, tobacco and pan masala. Technical report. Government of India, Ministry of Environment, Forest and Climate Change: 2016

142 <https://www.genano.com/sv/infobas/vaxthusgaser-och-deras-skadliga-effekter>

143 <http://www.who.int/fctc/publications/WHO-FCTC-Environment-Cigarette-smoking.pdf>

144 84 million tonnes is 0.168 % of 50 billion tonnes.

phase alone, WHO's report estimates that the real emissions are almost twice as large as the total emissions stated in e.g. British American Tobacco's report.

The WHO report also states that it was unable to embrace all parts of the tobacco business. For example, reliable data on the deforestation caused by tobacco cultivation could not be found. Also, the effects of forest fires caused by cigarette smoking had to be excluded. The conclusion in the report is therefore that the total climate impact is likely to be greater; calculations indicated that it could be twice as high¹⁴⁵.

If the calculations cited above regarding the effects of deforestation are added to the estimated manufacturing emissions of 15.7 million tonnes, the tobacco industry then accounts for 0.37 % of the global climate impact¹⁴⁶, a level comparable to the climate impact of entire countries.

Based on the fact that the energy used in the production of tobacco forms a major part of the industry's climate impact, several of the tobacco companies highlight how they embrace climate responsibility by shifting to renewable electricity. Japan Tobacco International, for example, proudly presents their renewable energy investment in the Jordan production facility, which has reduced the unit's climate impact by 10 %¹⁴⁷. Although – as for other industrial energy consumers – it is necessary to switch to renewable electricity in production facilities, it is misleading to say that this in itself signifies that the company embraces climate responsibility, since the tobacco production's greatest impact on climate comes from deforestation.

Access to energy is also a matter of resource allocation, i.e. there are many alternative uses for the energy that is produced. Consumers that today use non-renewable electricity could be supplied with renewable electricity, were it not spent on tobacco production. The renewable part of the tobacco production's electricity consumption can therefore also be said to be a burden for others, which is why it is interesting to look at the tobacco industry's entire energy consumption.

In its environmental report, British American Tobacco states that 2911 kWh/million cigarettes were used in 2017¹⁴⁸. If this is a representative energy requirement for cigarette production, then the total

145 https://pubs.acs.org/doi/suppl/10.1021/acs.est.8b01533/suppl_file/es8b01533_si_001.pdf, sida 26.

146 15.7 million tonnes is 0.03 % of 50 billion tonnes. Multiplied by 0.34 % this becomes 0.37.

147 https://www.jt.com/sustainability/report/pdf/2017/JT_Group_Sustainability_Report_FY2017.pdf

148 [http://www.bat.com/group/sites/UK_9D9KCY.nsf/vwPagesWebLive/DOAWWEKR/\\$file/Sustainability_Report_2017.pdf](http://www.bat.com/group/sites/UK_9D9KCY.nsf/vwPagesWebLive/DOAWWEKR/$file/Sustainability_Report_2017.pdf)

energy used to produce the 6,250 billion cigarettes smoked annually is 18.19 TWh, which is slightly more than, for example, what the Oskarshamn nuclear power plant could produce with all three reactors engaged¹⁴⁹. In WHO's report it is estimated that the tobacco industry's total energy use is 62.2 GJ¹⁵⁰. However, judging from background data in that report, it appears that this value has the wrong prefix. The 62,187.4 million MJ on which the calculations are based equals approximately 62.2 PJ (not GJ), which in turn is the same as 17.3 TWh¹⁵¹.

In conclusion, the tobacco industry has climate impact at all stages of the business, from deforestation to carbon dioxide emissions during production, transportation and the burning of plastics. In total, this impact is comparable to that of entire countries, even by the most conservative calculations of the industry's share of humanity's total climate impact.

Waste and air pollutants from production

The tobacco industry produces both solid waste and air pollutants. The solid waste is estimated to be as much as 25 million tonnes¹⁵² annually, and more than 200,000 tonnes of this is chemical waste¹⁵³. The tobacco industry is the 18th largest chemical waste producer in the world¹⁵⁴. Air pollutants include acidifying sulfur dioxide¹⁵⁵. The tobacco industry's total emission of sulfur dioxide equivalents is 452 million kg¹⁵⁶. By comparison, the total Swedish emission of sulfur dioxide is 19 million kg per year¹⁵⁷.

How waste is handled depends on environmental legislation in the country where the waste is generated. Tobacco companies tend to move their operations away from countries that tighten their environmental

legislation to countries where the rules are more lax¹⁵⁸. An example is when British American Tobacco closed a manufacturing facility in Uganda in 2013 and moved production to Kenya¹⁵⁹. Therefore it is not only a question of the volumes of waste that are generated, but also that the waste is often handled in the worst possible way. In several countries in Africa, waste from the tobacco industry, including hazardous waste, can be disposed of without any proper measures¹⁶⁰.

Several of the major tobacco companies report on their waste management. Japan Tobacco International buys more than 300,000 tonnes of non-tobacco material every year, some of which end up in landfills¹⁶¹. However, it is not just a matter of volume. According to the United States Environmental Protection Agency, more than 456,000 kg toxic chemicals including ammonia, nicotine, hydrochloric acid, methanol and nitrates were released in 2008 from tobacco manufacturing facilities¹⁶². Tobacco production contributes to acidification at all stages of the production chain. The background material for *Cigarette smoking – An assessment of tobacco's global environmental footprint across its entire supply chain, and policy strategies to reduce it* lists the contributions to acidification from the various activities in the tobacco industry, expressed in million kg of sulfur dioxide equivalents¹⁶³:

Cultivation	Curing	Processing	Cigarette production	Distribution	Consumption	Total
119	240	11	78	2.4	2.9	453

Acidification directly affects species that are unable to live in a more acidic environment. Acidification also releases toxic heavy metals from the soil and sediments¹⁶⁴. Ammonia from the tobacco industry also contributes to acidification, despite the fact that ammonia itself is a base. What happens chemically is that ammonia oxidizes to nitric acid when it ends up in the soil.

The environmental cost for one kg of emitted sulfur-dioxide equivalents is estimated to be EUR 8.83¹⁶⁵. Based on that estimate, the tobacco industry's environmental cost for acidification damage alone is

149 <http://www.okg.se/sv/Produktionsinformation/>

150 <https://pubs.acs.org/doi/abs/10.1021/acs.est.8b01533?journalCode=est&tag?ua=1>

151 Email correspondence with Nick Voulvoulis, Professor of Environmental Technology, Imperial College London, n.voulvoulis@imperial.ac.uk

152 <http://www.who.int/fctc/publications/WHO-FCTC-Enviroment-Cigarette-smoking.pdf?ua=1&ua=142>

153 Lee K, Botero NC, Novotny TE. Manage and mitigate punitive regulatory measures, enhance the corporate image, influence public policy: industry efforts to shape understanding of tobacco-attributable deforestation. Globalization and Health. 2016;12(1):55

154 https://tobaccocontrol.bmjjournals.org/content/8/1/75?utm_source=trendmd&utm_campaign=tc&utm_content=consumer&utm_term=0-A#ref-9

155 Tobacco industry to achieve industrial and commercial profits 752,556 billion yuan. Xinhua News. 1 December 2012 <http://www.news.cn/english>

156 <http://www.who.int/fctc/publications/WHO-FCTC-Enviroment-Cigarette-smoking.pdf?ua=1&ua=1>

157 <https://www.naturvardsverket.se/Sa-mar-miljon/Statistik-A-O/Svaveldioxid-till-luft/>

158 Benson P. Tobacco capitalism: growers, migrant workers, and the changing face of a global industry. New Jersey: Princeton University Press, 2011.

159 Wesonga N, Butagira T. BAT closes factory in Uganda. 2013

160 <http://www.bioline.org.br/pdf?er08029>

161 Environment, health and safety report 2013. Tokyo: Japan Tobacco International; 2013. https://www.jt.com/sustainability/report/pdf/2013/JT_Group_Sustainability_Report_FY2013.pdf

162 The Right to Know Network. Toxic release inventory database 312229: Other tobacco product manufacturing. <https://www.epa.gov/toxics-release-inventory-tri-program>

163 https://pubs.acs.org/doi/suppl/10.1021/acs.est.8b01533/suppl_file/es8b01533_si_001.pdf

164 <http://miljo.vgy.se/forsurning.html>

165 <http://www.ecocostsvalue.com/EVR/model/theory/2-emissions.html>

around EUR 4 billion, which corresponds to more than SEK 40 billion¹⁶⁶.

Waste from the industry also contains nicotine. Ironically, the demand for products with a lower nicotine content has lead to an increase in the nicotine concentration in production waste. The process that lowers the nicotine content in the product produces a special waste with a nicotine content of up to 18 grams/kg dry weight. In terms of nicotine concentration, the EU classification for hazardous waste is 500 mg/kg dry weight¹⁶⁷. The total nicotine level in the tobacco industry's waste amounts to 2,000 mg/kg solid waste¹⁶⁸. A Malawi study from 2008 has shown that the nicotine from tobacco plant industrial waste pollutes the water supply¹⁶⁹.

In conclusion, the tobacco industry not only generates large volumes of waste, of which a large part is hazardous waste, but this waste also risks being handled in very substandard ways when tobacco companies, in response to new environmental legislation, move production facilities to countries with weak environmental legislation. Both solid waste and air pollution, including acidifying sulfur dioxide, is generated. Nicotine is also a constituent of the hazardous waste generated.

Extensive water consumption in areas with insufficient water resources

With good access to drinking water in Sweden, it can be difficult for us to grasp that access to clean water can be a problem. The fact is, however, that globally, about 2 billion people lack access to running water in their homes¹⁷⁰, and as many as 700 million people do not have access to any clean water at all.¹⁷¹.

Tobacco production is extremely water-intensive. This is especially problematic when factories are located in areas with frequent droughts or an insufficient water supply. However, it is the cultivation of the tobacco plant that is probably the largest water-related problem. The tobacco plant requires 3–5 liters of water/m² daily

during the first weeks after sowing¹⁷². This means that it requires more water than many other plants, such as coffee, cocoa, melons and peanuts, but less water than e.g. bananas and sugar cane¹⁷³. Tobacco growing in arid areas is therefore stressful for the water supply in that area.

The report *Cigarette smoking – An assessment of tobacco´s global environmental footprint across its entire supply chain, and policy strategies to reduce it*¹⁷⁴ estimates the tobacco industry's total water consumption to be approximately 22.2 million cubic meters/year. This means that 3.7 liters of water is required to produce one cigarette. To accommodate those who smoke one pack a day, 27 cubic meters of water/year is required, which can be compared to the 4.3 cubic meters of water required to produce the meat that the average consumer eats in one year. However, the report also emphasizes that the major problem is not only one of volume, but rather the fact that the extracted groundwater is not returned, which leads to a gradual deterioration of the groundwater supply¹⁷⁵.

An example of a country with insufficient access to drinking water is Zambia, where 6.8 million people, two-fifths of the population, lack clean water in their homes¹⁷⁶. In spite of this, the country's tobacco production is expanding. Between 1993 and 2013, tobacco production in Zambia increased by as much as 350 %¹⁷⁷ and the six largest multinational tobacco companies turned around more than USD 346 billion in the country in 2016, which is 1580 % more than the country's gross national income¹⁷⁸! In Zambia it is estimated that 60 to 70 % of the water supply comes from groundwater. However, this groundwater is not replenished at the same pace as it is extracted. The country's groundwater reserves are therefore shrinking, which could lead to water shortages in the future¹⁷⁹.

In its sustainability report Japan Tobacco International calls it a win-win situation when they, by constructing groundwater wells for tobacco cultivation, also give households access to water¹⁸⁰. Initially, the company does provide a favor by helping to build wells, but if tobacco cultivation gradually drains the groundwater reserves, this is a short-term gain. The

166 EUR 8.8/kg multiplied by 453 million kg becomes EUR 3999.99 million.

167 https://tobaccocontrol.bmj.com/content/8/1/75?utm_source=trendmd&utm_campaign=tc&utm_content=consumer&utm_term=0-A#ref-9

168 <https://link.springer.com/article/10.1007/s10098-003-0218-7>

169 <http://www.bioline.org.br/pdf?er08029>

170 <https://www.sciencenews.org/article/future-will-people-have-enough-water-live>

171 https://www.oxfam.se/vatten?gclid=CjwKCAiA4o79BRBvEiwAjeoYF7IhlHMJzM5PQFG9Mq4fljyKNmLnWF7lwLjKOPKJY2xCF8Ug764RoCG34QAvD_BwE

172 <http://www.fao.org/land-water/databases-and-software/crop-information/tobacco/en/>

173 <http://www.fao.org/docrep/s2022e/s2022e02.htm>

174 <http://www.who.int/fctc/publications/WHO-FCTC-Enviroment-Cigarette-smoking.pdf?ua=1&ua=1>

175 <http://www.who.int/fctc/publications/WHO-FCTC-Enviroment-Cigarette-smoking.pdf?ua=1&ua=1>

176 <https://www.wateraid.org/where-we-work/zambia>

177 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5771190/>

178 <https://tobaccoatlas.org/country/zambia/>

179 http://earthwise.bgs.ac.uk/index.php/Hydrogeology_of_Zambia#Groundwater_use

180 <https://www.jti.com/our-views/understanding-wider-impact-our-work-zambia>



By constructing groundwater wells for tobacco cultivation, the tobacco companies also give households access to water. Initially, the company does provide a favor by helping to build wells, but if tobacco cultivation gradually drains the groundwater reserves, this is a short-term gain. Foto: Adobe Stock.

government of Zambia is aware of the problem with shrinking water reserves. In 2018 they introduced a fee for groundwater use in excess of 10,000 liters/day¹⁸¹. It remains to be seen whether this will dampen a continued expansion of the tobacco industry in the country.

The water used in the manufacturing process re-emerges as contaminated water. According to WHO, a total of 55 million cubic meters of contaminated water is produced¹⁸². By comparison, Sweden's over 1,700 sewage-treatment plants process about 1.5 billion cubic meters of wastewater every year¹⁸³. At best, the contaminated water from the tobacco industry is processed in sewage-treatment plants. At worst, it is discharged into lakes and rivers, unprocessed.

Furthermore, contaminated water also presents problems during processing in sewage-treatment plants, partly because of the presence of nicotine¹⁸⁴. A 2014 study showed that wastewater from the tobacco

industry was not only toxic to humans, but also to the microorganisms that are necessary for the purification process¹⁸⁵. The wastewater also contains heavy metals such as arsenic, lead, nickel, mercury, zinc and cadmium. According to the study, the concentrations are far above WHO's recommended limits for many of the heavy metals¹⁸⁶:

Element	Occurrence in wastewater (mg/l)	Limit (mg/l)
Zinc	3,05	1,0
Cadmium	0,05	0,01
Copper	0,244	0,1
Nickel	0,127	0,05

These heavy metals have a major negative impact on aquatic organisms, and eventually reach humans through the food chain¹⁸⁷.

In conclusion, the tobacco industry is an intensive consumer of water and also produces large amounts

181 <https://www.reuters.com/article/us-zambia-water-regulation/as-wells-dry-zambia-regulates-use-of-groundwater-idUSKCN1IH1DT>

182 <http://www.who.int/fctc/publications/WHO-FCTC-Environment-Cigarette-smoking.pdf?ua=1&ua=1>

183 <http://www.svensktvatten.se/fakta-om-vatten/avloppsfakta/>

184 <https://www.coresta.org/abstracts/degradation-tobacco-waste-water-and-influence-nicotine-degradation-performance-municipal>

185 <http://www.imedpub.com/articles/microbiological-physicochemical-and-genotoxicological-assessment-of-tobacco-wastewater.pdf>

186 <http://www.imedpub.com/articles/microbiological-physicochemical-and-genotoxicological-assessment-of-tobacco-wastewater.pdf>

187 Patil D, A lot's Fishy about Our Creek and Lake Fish, 2009.

of polluted wastewater. The greatest problem here is perhaps when the irrigation of tobacco plantations consumes groundwater to such an extent that these important reservoirs are drained.

Painful animal experiments without any benefit

Despite the fact that the health risks associated with smoking have been known for decades, the tobacco industry has continued to conduct animal experiments aimed at finding evidence to the contrary¹⁸⁸. These experiments can involve the use of devices that force monkeys, dogs or mice to inhale cigarette smoke.

Some examples of animal experiments that have been conducted:

- Philip Morris locked thousands of rats in small cages where they were forced to breathe tobacco smoke for 6 hours a day for 90 days. The rats were then killed and dissected to determine the damage caused by the smoke¹⁸⁹.
- Philip Morris also exposed a thousand rats to either diesel exhaust or tobacco smoke for six hours a day over two years, to determine how these respective conditions affected their lungs¹⁹⁰.
- R.J. Reynolds applied cigarette tar to more than a thousand mice and then forced them to breathe tobacco smoke. Some mice developed tumors. The surviving mice were killed and dissected¹⁹¹.
- At the Oregon National Primate Research Center, pregnant rhesus monkeys were exposed to nicotine during the final four months of pregnancy. A few days before birth the fetuses were extracted, killed and dissected in order to determine how the nicotine had affected them¹⁹².

Strong opinion against the tobacco industry's animal experiments emerged after journalist Mary Beith published a photographic report entitled "The smoking



Mary Beith's photos of "the smoking beagles" attracted much adverse attention in the 1970s. Photo: Mary Beith.

beagles" in the 1970s¹⁹³. To test new "safe" cigarettes, 48 beagles were forced to smoke up to 30 cigarettes a day. Beith managed to take pictures of the chained dogs, which attracted a lot of attention. Since then, several countries, including the United Kingdom, Germany, Belgium, Estonia and Slovakia, have restricted tobacco-related animal experiments¹⁹⁴.

However, tobacco-related animal experiments are still being conducted in Sweden. Astra Zeneca has a 2015–2021 permit to perform experiments on a total of 12,000 mice¹⁹⁵. Mice are exposed to cigarette smoke for 2 hours/day for up to 4 days/week for up to 6 months. The purpose is to increase our knowledge about COPD. To mimic COPD in humans, the animals are exposed to cigarette smoke in combination with inflammatory bacteria and viruses.

Uppsala University was granted permission in 2016 to carry out animal experiments over a five-year period in order to investigate the significance of an early onset age for alcohol and tobacco consumption¹⁹⁶. These experiments are a follow-on to previous experiments. According to the application, baby rats are taken from their mothers and exposed to substances for up to 6 hours/day during their first 21 days of life. In one of the trials, feeding is withheld for 23 hours before the test. The test is performed for 5 consecutive days.

The Swedish Animal Welfare Act states that: "Animal experiments may only take place provided that the activity is designed so that the animals are not subjected to greater suffering than absolutely necessary" and that the experiments must be "designed so that they cause the least suffering and the lowest the degree of permanent damage to the individual animal"¹⁹⁷. One might question the necessity of these

¹⁸⁸ <https://www.peta.org/issues/animals-used-for-experimentation/animals-used-experimentation-factsheets/smoking-experiments-animals/>

¹⁸⁹ Charles L. Gaworski *et al.*, "An Evaluation of the Toxicity of 95 Ingredients Added Individually to Experimental Cigarettes: Approach and Methods," *Inhalation Toxicology* 23 (2011): 1-12.

¹⁹⁰ Walter Stinn *et al.*, "Chronic Nose-Only Inhalation Study in Rats, Comparing Room-Aged Sidestream Cigarette Smoke and Diesel Engine Exhaust," *Inhalation Toxicology* 17 (2005): 549-76.

¹⁹¹ Mari S. Stavanya *et al.*, "Safety Assessment of High Fructose Corn Syrup (HFCS) as an Ingredient Added to Cigarette Tobacco," *Experimental and Toxicologic Pathology* 57 (2006): 267-81.

¹⁹² Theodore A. Slotkin *et al.*, "Prenatal Nicotine Exposure in Rhesus Monkeys Compromises Development of Brainstem and Cardiac Monoamine Pathways Involved in Perinatal Adaptation and Sudden Infant Death Syndrome: Amelioration by Vitamin C," *Neurotoxicology and Teratology* 33 (2011): 431-4.

¹⁹³ <https://www.theguardian.com/media/greenslade/2012/may/20/thepeople-investigative-journalism>

¹⁹⁴ <https://www.invitrojobs.com/index.php/en/news/news-archive/item/1095-u-s-tobacco-giant-stops-animal-testing>

¹⁹⁵ <https://issuu.com/djurensratt/docs/ansokan18-2016>

¹⁹⁶ <https://issuu.com/djurensratt/docs/ansokanc151-15>

¹⁹⁷ <https://lagen.nu/1988:534>

experiments, since we already know well-enough that tobacco is harmful.

However, planned animal experiments are not the only way that animals can suffer from the activities of the tobacco industry. Pets and other animals are also affected by passive smoking, as shown by a research group at the University of Glasgow in 2015¹⁹⁸. It was found that animals that lived in smoking homes suffer from health problems (including cancer) to a greater extent than animals living in non-smoking homes. In the study, cats were affected to a greater extent than dogs, despite the fact that the cats spent more time out of doors than the dogs. It was speculated that this was because cats ingest more residual smoking products than dogs, since they lick themselves more.

Pets can also suffer from acute nicotine poisoning after ingesting cigarette butts or other products containing nicotine, and this can be fatal¹⁹⁹. According to the American Association of Poison Control Centers, 1,212 dogs in the United States were poisoned by nicotine in 2013, and this is an increasing trend²⁰⁰. Of course, pets are not the only animals affected, even wild species can ingest cigarette butts, including birds²⁰¹.

In conclusion, the tobacco industry is both directly responsible for extensive painful animal experiments, and also indirectly responsible for animal suffering, caused by passive smoking or acute nicotine poisoning after ingesting nicotine products.

The environmental impact of tobacco smoke increases over time

Tobacco smoke pollutes the air long after a cigarette has been extinguished. The immediate effect is that the air becomes polluted in areas where smoking is most frequent²⁰². Measurable contributions to general air pollution have been shown in e.g. Los Angeles²⁰³

and London²⁰⁴, two cities where air quality has been problematic for a long time²⁰⁵. An estimated 9,500 people in London are considered to have died in 2018 due to air pollution²⁰⁶. While traffic accounts for the largest share of air pollution in Los Angeles, cigarette smoke is estimated to contribute between 1 and 1.3 %, according to a 1994 survey²⁰⁷. According to a 2004 study, a cigarette causes as much emission of PM 2.5 as a diesel car idling for 100 minutes²⁰⁸.

China has suffered from increasing problems with city air pollution during the 2000s²⁰⁹. According to WHO, more than one million people died in China in 2012 from diseases caused by air pollution²¹⁰, and the number of smokers in China has increased to 316 million²¹¹. China is one of the few countries that have not signed the WHO Tobacco Convention²¹².

Tobacco smoke contains a mixture of thousands of compounds in the form of gases or tiny droplets²¹³, the composition of which depends on combustion temperature. When a smoker draws air through a cigarette (mainstream smoke), the temperature rises to 950 °Celsius, thanks to the increased supply of oxygen. Between each draw, the temperature ranges from 6 - 800 °C. The smoke formed at the lower temperature (sidestream smoke) contains more of the toxic compounds: for example, 147 times more ammonia, 16 times more pyridine, 15 times more formaldehyde, 12 times more quinoline, 3 times more styrene, and twice as much nicotine. In addition, the smoke particles shrink to half their size at the higher temperature, which allows them penetrate deeper

²⁰⁴ Farren NJ, Ramírez N, Lee JD, Finessi E, Lewis AC, Hamilton JF. Estimated exposure risks from carcinogenic nitrosamines in urban airborne particulate matter. Environmental Science & Technology. 2015;49(16):9648–9656 https://pure.york.ac.uk/portal/files/39876289/acs_2Eest_2E5b01620.pdf

²⁰⁵ http://www.laist.com/2018/07/09/happy_smogiversity_la.php

²⁰⁶ <https://psmag.com/environment/air-pollution-is-killing-london>

²⁰⁷ <https://www.newscientist.com/article/mg14319391-300-warning-tobacco-seriously-causes-smog/>

²⁰⁸ Invernizzi, G., A. Ruprecht, R. Mazza, E. Rossetti, A. Sasco, S. Nardini, and R. Boffi. 2004. Particulate Matter from Tobacco Versus Diesel Car Exhaust: An Educational Perspective. Tobacco Control 13: 219–221.<https://doi.org/10.1136/tc.2003.005975>.

²⁰⁹ <http://inbeijing.se/bulletin/2017/10/30/peking-luft-fororenigar-blir-allt-varre/>

²¹⁰ <https://svenska.yle.fi/artikel/2016/09/27/who-miljoner-dor-av-luftforurenar>

²¹¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6546632/>

²¹² <https://sverigesradio.se/sida/artikel.aspx?programid=1637&artikel=6390947>

²¹³ Working group on the evaluation of carcinogenic risks to humans. Tobacco smoke and involuntary smoking. Technical report. Lyon, France: International Agency for Research on Cancer; 2004 <https://monographs.iarc.fr/ENG/Monographs/vol83/mono83.pdf>

¹⁹⁸ https://www.gla.ac.uk/news/archiveofnews/2015/december/headline_438291_en.html

¹⁹⁹ <https://www.petplace.com/article/dogs/pet-health/nicotine-toxicity-in-dogs/>

²⁰⁰ <https://wagwalking.com/condition/nicotine-poisoning>

²⁰¹ http://www.beachapedia.org/Cigarette_Butt_Litter

²⁰² Ott WR, Acevedo-Bolton V, Cheng KC, Jiang RT, Klepeis NE, Hildemann LM. Outdoor fine and ultrafine particle measurements at six bus stops with smoking on two California arterial highways – results of a pilot study. Journal of the Air & Waste Management Association. 2014;64(1):47–60.

²⁰³ Schauer JJ, Rogge WF, Hildemann LM, Masurek MA, Cass GR, and Simoneit BR. Source apportionment of airborne particulate matter using organic compounds as tracers. Atmospheric Environment. 1996;30(22):3837–3855



China has suffered from increasing problems with city air pollution during the 2000s. According to WHO, more than one million people died in China in 2012 from diseases caused by air pollution, and the number of smokers in China has increased to 316 million. Photo: Severe air pollution in Shanghai, China. Adobe Stock.

into the lung and further into the bloodstream²¹⁴. The smoke formed at the lower temperature is on average about four times as toxic as the smoke formed at the higher temperature²¹⁵.

All in all, the tobacco, the material that holds the processed tobacco leaves together, and the substances that are intentionally added to affect the appearance, taste, smell, color and absorption of the tobacco, all contribute to the amount and composition of the tobacco smoke that is generated and its long-term impact on the environment. The polluting effect of the 6.25 trillion cigarettes smoked yearly globally includes 3,000–6,000 tonnes of formaldehyde and 12,000–47,000 tonnes of nicotine, in addition to the greenhouse gases, carbon dioxide and methane²¹⁶. The damaging health effects of passive smoking have been known for a long time. In 1992, the US Environmental Protection Agency (EPA) issued a comprehensive

review of the harmful effects of passive smoking, establishing, among other things, a clear link between passive smoking and lung cancer²¹⁷.

Thirdhand smoke is a term used for cigarette smoke that accumulates (and remains for a long time) in dust, clothing, wallpaper and other surfaces. Its composition is more toxic than primary smoke²¹⁸. What happens chemically is that the smoke substances become oxidized, whereby new pollutants are formed²¹⁹. Thirdhand smoke gets increasingly toxic over time. For example, nicotine becomes air-oxidized to form new substances that were not present in the original smoke²²⁰. Nicotine can also react with ozone to form an organic aerosol, with minute particles²²¹. This is

217 Folkhälsoinstitutet 2001:16

218 <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0086391>

219 Northrup TF, Jacob III P, Benowitz NL, Hoh E, Quintana PJE, Hovell MF, et al. Thirdhand smoke: state of the science and a call for policy expansion. *Public Health Reports*. 2016;131(2):233– 238 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4765971/pdf/phr131000233.pdf>

220 Petrick L, Destaillats H, Zouev I, Sabach S, and Dubowski Y. Sorption, desorption, and surface oxidative fate of nicotine. *Physical Chemistry Chemical Physics*. 2010;12(35):10356–10364.

221 Sleiman M, Destaillats H, Smith JD, Liu CL, Ahmed M, Wilson KR, et al. Secondary organic aerosol formation from ozone-initiated reactions with nicotine and secondhand tobacco smoke. *Atmospheric Environment*. 2010;44(34):4191–4198

214 Anderson PJ, Wilson JD, Hiller FC. Respiratory tract deposition of ultrafine particles in subjects with obstructive or restrictive lung disease. *Chest*. 1990;97(5):1115–1120

215 Schick S, Glantz SA. Sidestream cigarette smoke toxicity increases with aging and exposure duration. *Tobacco Control*. 2006;15(6):424–429

216 Validation report v-055. Method validation for the determination of methane and ethylene in mainstream smoke. Technical report. California: Arista Laboratories; 2004.

problematic since ozonation is used to expel unpleasant odors in smoke-exposed rooms. As a consequence, while the odor problems are reduced, the health risks increase due to ozonation.

In contrast to the health risks of passive smoking, those associated with thirdhand smoke have only recently been investigated. The first studies came in 2004, where it was shown, among other things, that it was sufficient to sleep only one night in a smoky hotel room to get elevated levels of cotinine in one's urine. In 2016, a comprehensive review of the negative health effects of thirdhand smoke was published²²². The identified risks include impaired wound healing, cancer, diabetes and fatty liver²²³.

Further to the direct risk that thirdhand smoke in smoky rooms represent, indirect health problems can arise from the environmental pollutants that are formed when burning waste furniture, textiles and other objects where thirdhand smoke has accumulated. Cotinine is one of the toxic residues that break down very slowly²²⁴. The cotinine from tobacco products and smoke-contaminated objects has been shown to be one of the most common chemicals in water leaching from landfills²²⁵. In the United States cotinine has also been shown to penetrate into groundwater, agricultural irrigation water, and irrigated soil²²⁶. The environmental impact of tobacco thus reaches far beyond both the production and the consumption of tobacco. Conventional water purification does not completely remove nicotine and cotinine, which means that drinking water can also be contaminated²²⁷.

In conclusion, cigarette smoke continues to create problems long after a cigarette has been extinguished. The lower temperature smoke that is expelled between a smoker's inhalations is more toxic than the smoke drawn in during inhalation, and the thirdhand smoke that is created when smoke gets deposited on textiles, etc., becomes increasingly toxic over time, due to the effects of oxidation.

222 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5501723/>

223 <https://www.verywellhealth.com/what-is-third-hand-smoke-2248867>

224 <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=1325388&fileId=1325389>

225 Masoner JR, Kolpin DW, Furlong ET, Cozzarelli IM, Gray JL, Schwab EA. Contaminants of emerging concern in fresh leachate from landfills in the conterminous United States. Environmental Science: Processes & Impacts. 2014;16(10):2335–2354.

226 Kinney CA, Furlong ET, Werner SL, Cahill JD. Presence and distribution of wastewater-derived pharmaceuticals in soil irrigated with reclaimed water. Environmental Toxicology & Chemistry. 2006;25(2):317–326.

227 Boleda MR, Galceran MT, and Ventura F. Behavior of pharmaceuticals and drugs of abuse in a drinking water treatment plant (dwtp) using combined conventional and ultrafiltration and reverse osmosis (uf/ro) treatments. Environmental Pollution. 2011;159(6):1584–1591 <https://www.researchgate.net/publication/50988451>

Cigarette butts – poisonous junk and junky poison

Perhaps the most obvious environmental impact of smoking is the general nuisance of tobacco litter in the form of the cigarette butts, snus residue and snus pouches, which accumulate on streets and in public places. The cleaning up and disposal of tobacco litter is very costly and is financed solely by the taxpayer, not by the manufacturers/distributors or even by the tobacco users. The total cost for Swedish taxpayers is estimated to be SEK 225 per person and year²²⁸. According to calculations by the Uppsala municipality, sweeping-up litter from streets is 20 times more expensive than collecting litter from trash bins²²⁹. Every day an estimated 2.7 million cigarette butts are discarded onto Swedish streets, amounting to about one billion/year.

According to the association Keep Sweden Tidy, the total cost of littering in Sweden is SEK 2 billion/year²³⁰ and tobacco-related litter is estimated to account for about 80 % of the litter in Swedish cities²³¹. A volume estimate for the different categories of litter was made in 2020 by the Swedish Environmental Protection Agency in collaboration with Keep Sweden Tidy²³². The two most common types of litter were found to be cigarette butts (62 %) and snus pouches (14 %).

The municipality of Gothenburg estimates that the cost of handling cigarette butts amounts to 40 % of the total cost of their litter management²³³. If this value is representative elsewhere, then the total cost of handling all cigarette butts that are discarded in Swedish streets becomes SEK 800 million, and the cost of handling a single butt SEK 0.80²³⁴. That does not include the costs for other tobacco-related litter such as snus residue and empty cigarette packs!

Globally, litter from smoked cigarettes is estimated to weigh between 340 and 680 million kg, and litter from cigarette packaging a total of 2 million tonnes. This is not only a matter of weight. Tobacco litter contains more than 7,000 toxic chemicals, which end up on our streets, in our sewers and in our water. Research shows that harmful chemicals from cigarette butts such as nicotine, arsenic and cadmium can be acutely toxic to aquatic

228 <https://www.uppsala.se/kampanjsidor/renare-uppsala/>

229 <https://www.na.se/artikel/opinion/debatt/cigarettfimpen-den-varsta-nedskrapningsboven>

230 <https://www.vlt.se/artikel/opinion/debatt/skraper-kostar-tva-miljarder-varje-ar>

231 <https://www.hsr.se/fakta-om-skrap/samlade-fakta-om-skrap/varsta-skraper-fimpen>

232 <http://www.naturvardsverket.se/Nyheter-och-pressmeddelanden/Ny-matning-om-nedskrapning/>

233 <http://www.gp.se/nyheter/göteborg/fimpar-för-miljoner-1.802494>

234 40 % of SEK 2 billion is SEK 800 million. SEK 800 million/1 billion butts is 80 öre/butt.



Cigarette filters are made of plastic and break down into tiny plastic particles. Photo: Birds picking up cigarette butts. Adobe Stock.

organisms²³⁵. According to one study, a cigarette butt kept in 1 L of water provided a sufficient toxin concentration to kill half the fish in that water after 96 h²³⁶.

Cigarette butts dominate the litter in Swedish cities, as in many other cities of the world²³⁷. Since the 1980s, butts have accounted for 30–40 % of the total urban litter. On beaches, cigarette butts make up an average of 15 % of the litter²³⁸. During a beach cleaning in 2012²³⁹, butts comprised the most common litter (19 %), followed by food packaging (10 %), plastic bottles (10 %) and plastic bags (8 %).

Tossing a cigarette butt on the ground is one of the most accepted forms of littering, globally. According to a study in Washington, USA, one in three smoked

cigarettes had been dumped directly on the ground²⁴⁰, and other studies have shown that most smokers at least occasionally discard their cigarette butts this way²⁴¹. Even when suitable ashtrays or the like are available, many smokers anyway cast their cigarette butts to the ground²⁴².

Cigarette filters further exaggerate this problem, as they do not break down except under special circumstances, and then into tiny plastic particles. In *Utredningen om hållbara plastmaterial, M 2017:06, delredovisning 1* (Investigation into sustainable plastics, part 1) published in March 2018, cigarette butts were identified as the plastic objects that are particularly frequent in litter, and associated with a risk of damage to aquatic organisms²⁴³. Globally, cigarette filters are regarded as one of the most

235 Wright S, Rowe D, Reid M, Thomas K, Galloway T. Bioaccumulation and biological effects of cigarette litter in marine worms. *Scientific Reports*, 5, 2015

236 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. *Tobacco Control*. 2011;20(Suppl 1):i25–i29 http://tobaccocontrol.bmjjournals.org/content/20/Suppl_1/i25

237 Novotny TE, Slaughter E. Tobacco product waste: an environmental approach to reduce tobacco consumption. *Current Environmental Health Reports*. 2014;1(3):208–216

238 http://www.tobaksfakta.se/wp-content/uploads/2018/02/TF-Faktablad_Hemsidan_Tobaken-hindrar-hållbar-utveckling_HÖG_1.pdf

239 https://www.researchgate.net/publication/264674935_Tobacco_Product_Waste_An_Environmental_Approach_to_Reduce_Tobacco_Consumption

240 Prevent stormwater pollution, Tacoma: City of Tacoma; 2013

241 Rath JM, Rubenstein RA, Curry LE, Shank SE, Cartwright JC. Cigarette litter: smokers' attitudes and behaviors. *International Journal of Environmental Research and Public Health*. 2012;9(6):2189–2203 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3397372/>

242 Patel V, Thomson GW, Wilson N. Cigarette butt littering in city streets: a new methodology for studying and results. *Tobacco Control*. 2013;22(1):59–62

243 <https://www.regeringen.se/49592d/contentassets/a709b-3731d1542479a4d76cec9ba6d63/delredovisning-fran-utredaren-mars-2018.pdf>



As many as 4 500 billion butts are discarded onto the ground every year. Photo: www.pexels.com.

common forms of plastic waste²⁴⁴. Despite the global focus on disposable plastic articles such as straws, etc., cigarette filters constitute a greater problem when it comes to plastic waste in the oceans²⁴⁵. A filter weighs 0.17 grams²⁴⁶ and 90 % of all cigarette butts have plastic filters²⁴⁷. This means that the plastic in the 4,500 billion butts discarded onto the ground each year amounts to 688,000 tonnes. For comparison, it is estimated that 8 million tonnes of plastic end up in the oceans every year²⁴⁸. To fulfill the EU directive on measures to reduce the problems associated with plastics, the Swedish government has (Autumn 2020) appointed an investigation, which, among other things, will suggest ways to increase producer responsibility for tobacco products with filters²⁴⁹.

The toxins in a cigarette butt originate from all stages in the tobacco production, and include

pesticides, additives and substances generated by smoking²⁵⁰. These toxins include the heavy metals lead and cadmium²⁵¹. Furthermore, a study from 2011 showed that these heavy metals leak continuously from a butt²⁵². However, the amount of cadmium/cigarette varies greatly depending on the origin of the tobacco²⁵³.

Cadmium is toxic to microorganisms and aquatic species, but also gets taken up by the root systems of plants and thus can be transferred into our food. Cadmium accumulates in the kidneys, which means that kidney function can be damaged by long-time exposure to cadmium. Other studies have shown that cadmium can contribute to osteoporosis and bone fractures. Cadmium can also be carcinogenic²⁵⁴.

Cigarettes can contain high levels of cadmium and smokers are therefore liable to be exposed to twice the amount of cadmium compared to non-smokers²⁵⁵. Even though only small amounts of cadmium are present in each cigarette butt, the total release into the environment is high. Globally, it is estimated that

244 <https://www.ashscotland.org.uk/media/745335/cigarette-butts-plastic-litter.pdf>

245 <https://globalnews.ca/news/4418956/cigarette-butts-ocean-pollution-ban/>

246 <http://www.longwood.edu/cleanva/cigbutthowmany.htm>

247 <https://www.forbes.com/sites/trevornace/2018/09/06/no-plastic-straws-are-not-the-worst-ocean-contaminant-cigarette-butts-are/#7759e03766c7>

248 <https://www.hsr.se/fakta/fakta-om-skrap/plast-ett-stort-problem-i-vara-hav>

249 <https://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Plast/Engangsplast--nya-krav-for-flera-produkter/#utokat>

250 Tobacco: Fact sheet. Geneva: World Health Organization; 2016 <http://www.who.int/mediacentre/factsheets/fs339/en/>

251 <https://www.hsr.se/fakta-om-skrap/samlade-fakta-om-skrap/varsta-skrapet-fimpen>

252 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3088461/>

253 <https://www.hindawi.com/journals/tswj/2012/729430/>

254 <https://www.naturvardsverket.se/Sa-mar-miljon/Manniska/Miljogifter/Metaller/Kadmium/>

255 <https://www.verywellmind.com/cadmium-in-cigarette-smoke-2824729>

4,500 billion butts are discarded onto the ground each year, and a study from 2011 shows that regardless of whether it is only the filter that is discarded or a filter in combination with tobacco residue, the cigarette butt is acutely toxic to aquatic organisms²⁵⁶.

In conclusion, the cigarette butt in the street causes large cleanup costs and leads to environmental damage. Most noticeable are the large volumes of plastic from cigarette filters that end up in the oceans, and each cigarette butt is also a source of over 7,000 environmental toxins, including cadmium.

Concluding remarks

The bill "Ny lag om tobak och liknande produkter 2017/18:156" (New law concerning tobacco and similar products) which was submitted to the Swedish Parliament in March 2018²⁵⁷ emphasizes that tobacco smoking kills 5.4 million people each year and is the western world's single largest preventable health problem. Furthermore, the bill emphasizes that more than 50 % of smokers die from their cigarettes and that every smoker loses an average ten years of their lifetime. However, the environmental impact of tobacco is not mentioned in the bill.

Broadening our perspective from dealing only with public health issues to considering the total environmental impact of the tobacco industry is important for increasing political pressure to achieve a tobacco-free society. The counter arguments that everyone has the right to decide about one's own health, or that snus is a healthier alternative to cigarettes, lose relevance when the total environmental effects of the tobacco industry are put in focus, rather than concentrating purely on the health risks of smoking.

As shown in this review of the latest research, the tobacco industry affects the environment in a wide range of ways:

- Tobacco cultivation occupies extensive areas of arable land better used for food production.
- Tobacco cultivation destroys the land by causing erosion, lowered groundwater levels, nutrient depletion and loss of important terrestrial organisms.
- The extensive use of pesticides causes health problems for tobacco growers and affects surrounding agricultural and aquatic environments, not least in the form of reduced biological diversity.

- Tobacco growers are at risk of contracting "Green Tobacco Sickness (GTS)" from skin contact with nicotine. The 1.3 million children under the age of 14 who work in tobacco farms are particularly vulnerable.
- The utilization of new arable land as well as the use of firewood for tobacco curing causes extensive deforestation, and thus also a reduction of biological diversity.
- All stages of tobacco production impact on our climate, from deforestation to carbon dioxide emissions during manufacture and transport.
- Production involves extensive energy consumption and utilization of natural resources that could be used for other purposes.
- Production gives rise to large volumes of waste, some of it hazardous, which risks being handled in substandard ways when tobacco companies move production facilities into countries with weak environmental legislation.
- Both the production phase and the consumption phase cause air pollution, e.g. in the form of acidifying sulfur dioxide.
- Production involves extensive water consumption, which among other things depletes groundwater resources in arid areas.
- Painful animal experiments are still being carried out. Animals are also suffering and dying from passive smoking or acute nicotine poisoning.
- Even after a cigarette has been extinguished, there is a continued release of cotinine and other toxins that form in thirdhand smoke (created when smoke settles on textiles, etc.).
- Not only are cigarette butts and other tobacco-related products the most common litter in our cities, they also contain a wide range of environmental toxins, such as cadmium.
- Large volumes of plastic debris in the oceans stem from the thousands of millions of cigarette filters in discarded butts.

Some of these environmental problems can be avoided through better management, such as deposit and refund recycling bin systems to reduce littering or switching to renewable electricity supplies during production. However, most of the environmental problems caused by the tobacco industry appear impossible to resolve. Nicotine remains a poison no matter how the production is managed and tobacco cultivation will always require large areas of land and cause soil depletion, etc.

Many measures must be undertaken in order to achieve sustainable development. One such is indisputably a sharp reduction in the use of tobacco or preferably its complete elimination.

²⁵⁶ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3088407/>

²⁵⁷ https://www.riksdagen.se/sv/dokument-lagar/dokument/proposition/ny-lag-om-tobak-och-liknande-produkter_H503156/html



Environmental impacts of the tobacco industry – a survey of the research situation in 2020

This report on the environmental impacts of the tobacco industry was initiated by VISIR and compiled by Niclas Malmberg.

VISIR (*Vi som inte röker*, i.e. We Who Do Not Smoke) is a religiously and politically impartial organization working since 1974 to reduce the use of tobacco. VISIR's vision is a tobacco-free society. In 2020 the organization held operational subsidies from the Public Health Agency of Sweden.

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