

Vape Waste

The environmental harms of disposable vapes



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| Introduction

Nothing used for a day or two should pollute our environment for hundreds of years. While we know about the waste from single-use plastics, disposable electronics are often overlooked. It offends common sense to routinely junk some of the most intricately complex objects humans have learned to produce with their layers of integrated circuits, scarce and toxic metals, and world-spanning supply chains. With e-waste the fastest growing waste stream in the U.S.,¹ the rate at which we dispose of electronics is not sustainable.

One product stands apart as being particularly harmful to our environment and public health—disposable vapes. Vapes, also known as e-cigarettes, are handheld battery powered electronic devices with heated metal coils that vaporize a liquid containing nicotine or cannabis products, known as e-liquid.² Nicotine is the famously addictive stimulant found in tobacco that gives smokers a dopamine hit, and makes quitting difficult.³

Much has been made of the public health harms of disposable vapes,⁴ but this report aims to understand their effects as hazardous electronic waste. It doesn't make any sense to manufacture electronics with rechargeable batteries, ship them across the world, and throw them out within a few days.

Disposable vapes are single-use products powered by the same rechargeable lithium-ion batteries used in electric cars and iPhones.⁵ However, unlike traditional vapes, they're designed to be thrown out after use.⁶ That's because while some can be recharged with a USB cable, once they run out of the included e-liquid they can't be refilled.⁷ They're wasteful, harmful, and trending.

After the Food and Drug Administration's (FDA) February 2020 crackdown on flavored nicotine e-liquid cartridges for reusable vapes, sales of disposable brands increased 196.2% by March 2023, according to the CDC Foundation.⁸ The FDA's decision prohibited the sale of flavored pre-filled nicotine vape cartridges exemplified by popular brand JUUL, but didn't mention disposable vapes.⁹ This sin of omission created a gray market and by March sales of disposable products increased to 11.9 million units a month and have overtaken cartridges market share at 53% of vape sales.¹⁰ At this rate, we throw out 4.5 disposable vapes per second.¹¹

High-capacity bar-style nicotine vapes such as Puff Bars, Hyde, and innumerable copycats are the most popular with youth according to the 2022 National Youth Tobacco Survey.¹² They're ubiquitous on college campuses¹³ and explicitly sold as [disposable](#).¹⁴

While users are harming themselves, the environmental effects of disposable vapes hurt all of us.

Few products are as harmful and popular as disposable vapes. We shouldn't tolerate any disposable electronics, especially products that trash our environment and public health. This

report examines the environmental effects of disposable vapes and includes recommendations to kick our addiction to these damaging products.

| Findings

Annual vape waste stretches for over 7,000 miles, and it's harming our oceans

According to CDC Foundation sales estimates, lining-up the disposable vapes sold in a year would stretch for 7,010 miles—long enough to span the continental U.S. twice.¹⁵ This vape waste is becoming more common while cigarette butts become less common as the trash that litters our beaches and waterways.¹⁶ “Vape pens, the battery-operated e-cigarettes that heat the fluid for vaping, contain lead and mercury that can leach into soil or sand,” reportedly said University of California at San Francisco researcher Yogi Hendlin.¹⁷ Beach cleanup volunteers report finding disposable vapes an increasing problem. It seems we’ve gone from bad to worse. A 2019 report by the Ocean Conservancy found cigarette butts were no longer the most common polluting item on beaches.¹⁸ While cigarette pollution takes up to 10 years to degrade,¹⁹ disposable vapes are non-biodegradable and “endanger ocean creatures that inadvertently consume the plastics.”²⁰ A study that looked at the effects of vape waste on aquatic plants found, “disposable vapes pose a novel threat to aquatic ecosystems and it would be prudent to prevent them from becoming the next top litter item.”²¹ Who looked at cigarette butts polluting our beaches and thought, “how can I make a product that will more effectively trash our oceans by never decomposing?”

Electronic waste is a growing environmental concern

Despite making up only 2% of the U.S. waste stream, e-waste is responsible for two-thirds of heavy metals in landfills.²² In the United States, we generate about 7.6 million tons of e-waste each year.²³

These materials are difficult to recycle properly. There’s a lack of infrastructure and regulation around e-waste recycling.²⁴

We can’t recycle our way out

Electronics often contain hazardous materials such as the heavy metals lead and mercury.²⁹ According to the UN, “recycling activities are not keeping pace with the global growth of e-waste.”³⁰ The agency’s report found just 9.4% of e-waste is recycled in the Americas.³¹ It’s not just a capacity problem. We don’t have the technology to take complex products such as a disposable vape and magically melt them back into their component parts.³² We might never.

We can’t recycle our way out of the problems caused by increasing electronics manufacturing. While it’s better to recycle than not, our priority should be making fewer devices that solve real problems. Not churning out junk we don’t need in the first place.

There is no standard legal way to recycle disposable vapes

Most spent disposable vapes will never face the challenges of recycling because they aren’t properly collected as e-waste. According to the Truth Initiative’s [report](#):

Currently, there is no standardized way to recycle e-cigarettes in the U.S. Starting in 2019, the Drug Enforcement Agency (DEA) began accepting e-cigarette devices and cartridges during their annual National Prescription Take Back Day, although the DEA cannot accept devices containing lithium ion batteries.”³³

With no standard legal way to recycle disposable vapes,³⁴ and the already low e-waste recycling rate of less than 10%,³⁵ the vast majority of these products will end up in landfills or our waterways after they run out of juice. Extracting, manufacturing, shipping, using, and tossing electronics is just absurd. Manufacturing electronics releases carbon pollution at every step of its lifecycle, requires the extraction and disposal of critical metals that are needed for future tech, and in this case, the result is a product which can harm the user.³⁶ It just doesn't make sense.

Vape waste contains plastics, electronics, and chemical waste

Disposable vapes are encased in plastic shells³⁷ that never fully degrade.³⁸ They follow in the footsteps of other environmentally harmful single-use pod products, such as coffee pods, or even [pod-using hair dye](#). According to French researcher Jérémie Pourchez, “The comparison between vape pods and coffee capsules fits well, since e-cigarettes are intentionally designed to be convenient and single-use, and both are (largely) non-biodegradable and poorly recyclable.”³⁹

Electronic waste produced from disposable vapes includes both the circuit boards and lithium ion batteries that power the device.⁴⁰ These boards contain some of the heavy metals mentioned above, which can leach into the groundwater.⁴¹

Due to the nicotine e-liquid used in these products, vape waste can't be recycled with other plastics because the substance is defined by the EPA as an acute hazardous waste.⁴²

Disposable vapes can't be reused, they can't be recycled properly, and they can't legally be thrown in the trash. What are consumers supposed to do with these products? Is it any wonder they're an environmental threat?

Critical metals needed for electronics such as lithium are finite. Why are we throwing them out?

The lithium used by the batteries in the disposable vapes sold every year weighs 23.6 tons, equivalent to the lithium needed to create batteries for 2,600 electric vehicles.²⁵ Tech like vapes require metals such as cobalt, platinum, gold and rare earth elements.²⁶ Mining for these minerals is destructive. These metals are not infinite, and at some point we'll run out.²⁷ According to the UN, to meet future demands the industry will have to transition from mining for virgin materials to extracting metals from the so-called “urban mine” created from e-waste.²⁸ “There is 100 times more gold in a tonne of e-waste than in a tonne of gold ore,” explains a UN [report](#) on metal recycling. The agency already [estimates](#) global e-waste produced each year is worth \$62.5 billion. We can't afford to throw out these valuable and finite resources.

| Recommendations

We shouldn't tolerate any disposable electronics and disposable vapes are easily the worst of the bunch. These products harm our health and environment. They waste the finite resources needed for manufacturing new technology. The only solution is a ban.

Federal enforcement

At the federal level, the FDA should enforce their rules against the sale of unauthorized disposable vapes. Enforcement has been growing to meet the scale of the problem, as “[f]rom January 2021 through May 2023, FDA issued more than 560 warning letters to firms for manufacturing, selling, and/or distributing new tobacco products without marketing authorization from FDA.”⁵¹ These actions are a strong start, but findings show these products are still ubiquitous and easy to buy. The environmental harms of disposable vapes should add urgency to the FDA's enforcement and should foreclose authorization of any future proposals to sell disposable vapes.

State legislation

While many states and cities have banned flavored vapes, few have completely banned vapes, and none have explicitly targeted disposable products.⁵⁵ Flavor bans which replicate the same sin of omission perpetrated by the FDA have allowed the disposable graymarket to thrive. More states and cities should follow their mandates to protect health and environment by definitively banning disposables.

Retailers

Convenience store and gas station retailers shouldn't sell disposable vapes. These harmful products have no place on our store shelves. 7-Eleven locations, and gas company convenience stores with the Shell, Chevron, BP, Sunoco, Citgo, Mobil, Marathon, Exxon, Valero, and Conoco brands have all received warnings from the FDA, “for selling unauthorized tobacco products, specifically Elf Bar and Esco Bars vape products.”^{56 57} These national chains should hold franchisees and local locations accountable with a zero-tolerance stance.

| Conclusions

We can't afford to manufacture, sell, use, and toss disposable electronics. Throwing out rechargeable lithium ion batteries after one use doesn't make any sense.

It's true that nothing we use for only a day should pollute our environment for hundreds of years. As we move away from other disposable products such as single-use plastics, we should be aware of the growing number of electronic products that are similarly unsustainable.

Even harmful plastics have important medical uses. Disposable vapes on the other hand are both harmful and useless. Beyond their unsustainable design, even their intended use is damaging.

Some things are too harmful and useless to be tolerated in our society. We shouldn't manufacture, use, or sell disposable vapes. Disposable vapes might be the worst product ever invented. Let's kick our addiction to disposability and use products designed to last.

| Methodology

In order to calculate that we're throwing out 4.5 disposable vapes per second in the U.S. I used the monthly sales estimates of 11.9 million sold per month from the CDC Foundation⁵⁸, multiplied by 12 months, divided by 31,536,000 seconds in a year⁵⁹ = 4.5 disposable vapes thrown out per second. I assumed vapes sold will be thrown out given there is no legal standard recycling method in the U.S.⁶⁰

In order to calculate that a year's worth of vape waste would stretch for 7,010 miles, took the length of a bar-style disposable vape as 79 mm long⁶¹ or multiplied by the monthly sales estimates from the CDC Foundation of 11.9 million units⁶² multiplied by 12 months for a year's distance of 7,010 miles. Dividing this distance by the width of the continental U.S. of 2,802 miles⁶³, is $7,010 \text{ miles} / 2,802 \text{ miles} = 2.5$.

In order to calculate that the lithium used by the annual sales of the batteries in disposable vapes weighs 23.6 tons, I used the estimated lithium used by a single disposable vape as 0.15 g from Material Focus' report on the environmental effects of disposable vapes.⁶⁴ I multiplied 0.15g of lithium by 11.9 million units sold per month as above, multiplied by 12 months which comes out to 21,420,000g. With 907,185 grams in 1 ton, total grams divided by grams in a ton gives us 23.6 tons. I assumed the typical electric vehicle battery needs 8 kg of lithium according to an article in Nature,⁶⁵ and divided 23.6 tons (21,420 kg) by 8 kg per vehicle, resulting in 2,677.5 electrical vehicles worth of lithium per year.

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