

Background Paper: Disposable electronic cigarettes (D-ENDS) in selected countries and their characteristics. A short overview of the available evidence.

Introduction to disposable ENDS

Electronic nicotine delivery systems (ENDS), commonly known as e-cigarettes, were initially created in 2003 in China, but they really started to circulate on the global market from around 2008-2009. They exist in different forms, with older generations called “cig-a-like” imitating conventional cigarettes in appearance. More recent types of ENDS are open systems (third generation ENDS, or MODs — open/modifiable devices — that is, bulky ENDS where the consumer can mix their own e-liquid) or the cartridge systems (fourth generation, PODS, like the brand Juul, or new brands like VEEV by Philip Morris International, or PMI).¹ ENDS can also be produced without nicotine, in which case they are referred to as Electronic non-nicotine device systems or ENNDS.

Since 2018-2019, a new (or fifth) generation of ENDS has appeared on global markets: the disposable e-cigarette (D-ENDS). Normally, D-ENDS are composite products discarded after the e-liquid content is consumed, which means that all device components (plastic, metal, lithium battery, toxic chemicals, etc.) are simply thrown away. This, combined with the health risks of those products, raises a major environmental issue. Some brands of D-ENDS also commercialize non-nicotine products or D-ENNDS. Even if free from nicotine, D-ENNDS are composite products raising the same issues as D-ENDS. Throughout this document, we will refer generally to D-ENDS.

The first major brand of D-ENDS to appear was the Puff Bar, which is sometimes used as a general name for those products. They flooded the US market in 2019, rapidly displacing the Juul, especially among youth. In Europe, D-ENDS seem to have appeared in late 2019-early 2020. Initially, also because of the Covid-19 crisis and lockdown, many health professionals did not notice its arrival and health authorities have been very slow to respond.²

Most, if not all, D-ENDS are produced in China, and the main production location is the city of Shenzhen. The market is very opaque, with a few major companies dominating the market (but sometimes the same company has different names and identities, which makes a mapping of the market very difficult). However, some big tobacco companies are trying to catch up and are introducing their own D-ENDS brands, like Vuse by British American Tobacco (BAT).

Characteristics of disposable e-cigarettes

Technologically speaking, a D-ENDS is a very simple product composed of a casing (metal or plastic), a battery of variable strength, a heating element, a small container with a cotton ball (sometime replaced by a form of plastic) imbibed with the e-liquid. To “puff” is very simple: there are no

¹ For general information about ENDS, please check this page: <https://www.at-schweiz.ch/en/knowledge/products/ends>

² For general information and a factsheet on disposable ENDS please refer to this page: <https://www.at-schweiz.ch/en/knowledge/products/puffbar>

buttons to press, one just need to bring the device to the lips and take a drag, the device then heats the e-liquid automatically.

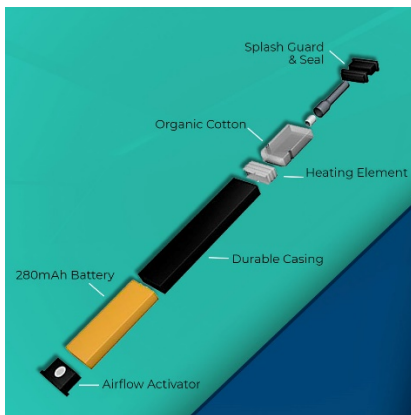


Fig. 1: usually a disposable ENDS is composed by 1- airflow activator, 2- battery, 3- casing, 4- plastic tube containing cotton imbibed with e-liquid.

The three main parts of the device are:

The battery: batteries range from 280mAh to 850mAh. Even if most devices contain rechargeable lithium-ion batteries, the products are designed to be discarded once the liquid runs out.

The coil: this is a metal element that is heated. Usually, it is inserted right into the core of the imbibed cotton to heat it up. Given the huge number of different products, it is difficult to know exactly which metals the coil is made of. There is a risk that this metal coil will release heavy metals in the heating process. During the use of a D-ENDS, when the liquid diminishes, the coil will tend to heat at an increased temperature, which can easily rise above combustion level.

The pod: the plastic pod contains a piece of cotton imbibed with the fluid. The cotton and part of the liquid are organic materials; they therefore degrade over time and many products have a time-limited consumption date and are unstable. Usually, the size and capacity of the pod ranges from 300 up to 15 000 puffs, or number of inhalations. It is usually considered that an Elf bar 800 gives a nicotine equivalent of 60 cigarettes, therefore a 15 000 D-ENDS would then correspond to 1,125 and can be found on an US website for the price of US\$19.99. (1)

The e-liquid: The composition of the fluid (commonly referred as e-liquid) is not always clearly defined and shows a large variation within brands and manufacturers. (2) More than 80 compounds have been detected in liquids and aerosols. ENDS almost always contain nicotine, and the addition of flavourings increases the toxicity of ENDS aerosol in a significant manner. There is also a large and increasing number of flavourings. (3) It be noted that in 2022, China banned the inland sale of ENDS flavours other than that of tobacco, but not their export abroad. (4) The heat generated by ENDS leads to the oxidation and decomposition of its components, eventually forming harmful constituents in the inhaled vapor. Therefore, the toxicity of fluids and aerosols should be measured separately.

D-ENDS Availability and regulation

About 47 countries have banned ENDS in general. (5) However, regulations are very different, and a ban can cover some aspects but not others (sale, import, possession) which makes clear mapping difficult. In addition, in countries with existing bans, there sometimes exist tolerated “illicit” markets.

Of the other countries where ENDS are not banned, only one currently seems to have specifically banned disposable ENDS: the French overseas territory of New Caledonia. Some European countries are discussing a possible ban of D-ENDS (at government or parliamentary level), but no country has taken action yet (those countries include Ireland, France, Germany, the Scottish devolved government and the rest of the UK).

Table 1: ENDS bans per WHO regions (indicative)

	ENDS are formally banned* in:	Comment
African Region (AFR)	Gambia, Mauritius, Uganda	Only a handful of countries have adopted a ban, D-ENDS are appearing in increasing numbers of countries too.
Region of the Americas (AMR)	Argentina, Brazil, Chile, Colombia, Mexico, Panama, Suriname, Uruguay, Venezuela	In Brazil and Mexico, D-ENDS appear to circulate freely, and web shops are commonplace. (6)
South-East Asian Region (SEAR)	Brunei Darussalam, Cambodia, DPR of Korea, India, Malaysia, Singapore, Sri Lanka, Thailand, Timor-Leste	In some countries the ban is clearly enforced, in others like Thailand we note a presence of sale through social media channels (Facebook (FB), Tiktok).
European Region (EUR)	Only Turkmenistan appears to have adopted a ban.	Most countries allow ENDS and D-ENDS, and products are cheap and readily available. In the European Union (EU), it appears that there is little effective control on D-ENDS’ chemical contents.
Eastern Mediterranean Region (EMR)	Bahrain, Egypt, Ethiopia, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, the West Bank and Gaza Strip, Oman, Qatar, Syrian Arab Republic	Ban enforcement appears to differ among countries. In at least some, however, D-ENDS are freely distributed (ex. Lebanon). (7)
Western Pacific Region (WPR)	French overseas territory of New Caledonia appears to be the only territory to have specifically banned D-ENDS	Australia has strongly regulated ENDS, which can be sold only in pharmacies (since October 2021), however this ban has not been effective given steep of D-ENDS consumption among youth. (8)

**This list is not complete. There is no central full updated repository of laws regulating ENDS. Some resources are helpful: <https://www.tobaccocontrolaws.org/>*

According to its own manufacturer declaration, Elf bar is a major global brand of D-ENDS, present in at least 80 countries. (9)

For countries where ENDS have not been totally banned, regulation is often poor. D-ENDS appeared on the market in 2018-2019 but did not attract much attention at first. They really started to be sold more systematically in Europe only in 2020. At the time, more attention was given to products like Juul (pods ENDS), but D-ENDS rapidly displaced Juul, and it disappeared from European markets in December 2021. The arrival of D-ENDS was also overlooked because they appeared on most markets during the Covid-19 lockdown restrictions.

In addition, we also observe a strong industry lobbying activity to regulate newer products (heated tobacco products, or HTPs, snus and nicotine pouches, and ENDS in all its forms) as little as possible, often insisting on rhetoric pretending that they are a “safer” alternative to tobacco products (as long term impacts are not known, nobody can today scientifically evaluate how much, if at all, those products are less risky than tobacco products).

Generally, D-ENDS are allowed in many markets without any effective form of control. Only limited regulation exists in many jurisdictions. Nicotine content is regulated in the EU (plus the UK, Switzerland, and others) with a maximum limit of 20 mg/ml (or 2%). This is already considered a strong concentration. In many other countries (US, South-East Asia), it is easy to find products with 50 or 60 mg/ml. The volume in closed ENDS-like D-ENDS is also limited to a maximum of 2 ml, as in the EU, which generally allows up to 600 to 800 puffs, However, it is common to find D-ENDS with contents exceeding 2 ml in many EU countries.

Taxation often lags behind. Generally, we observe that ENDS and D-ENDS are extremely cheap in comparison to tobacco products, and in many countries, they are not taxed or only lightly. In considering taxation, we should also consider the profit margins on these products: from production to sale, profits can easily exceed 1000% of the production and distribution costs. Prices drive the markets: in the UK, a recent increase of taxation has brought the price of cigarettes to more than £15 (US\$19.30), while one can easily find D-ENDS for prices starting at £4. With the recent economic crisis, how is this price gap affecting consumers?

D-ENDS distribution networks are also expanding very rapidly. In Bangladesh, data published on 4 April 2023, showed that nearly 78% of e-cigarette outlets opened in the five years from 2017—2021: while once ENDS shops were found mostly in wealthier areas of Dhaka, they are now open across the country. (10)

Market information

According to some market reports, the global market value in 2022 was of US\$ 6.8 billion, with a forecast to reach US\$ 14.8 billion by 2030.(11) However, market and financial data collection is very difficult for this market, and we consider available data as being gross underestimations. Two elements support our view on this point.

- A Chinese wholesale web page offered over 230 000 different products in November 2021; in March 2023, the number of different disposable ENDS on this website was around

550 000.(12) The Made-in-China web page is in English only and appears to be focused only on goods for exported out of China.

- In the UK, in February 2023, one single product of one brand (the Elf Bar 600) was selling 2.5 million units per month at £5.99 per unit, which if multiplied by 52 weeks, works out as over £778.7 million, annually.

Currently, major markets appear to be rich countries like the US and Europe, but the situation is evolving very fast, and D-ENDS are already available in many countries, including countries where ENDS are supposedly banned. According to a market report, in the Middle East and Africa, the market for D-ENDS is expected to witness a compound annual growth rate (CAGR) of 12.7% up to 2030. (11) This is probably, again, an underestimation. In Switzerland it is estimated that the D-ENDS market increased by 2200% in 2022, based on distributor data. (13)

We should also consider the amount of investment made in this market. Although information is vague, a single example can be telling. Geekvape built its own Zhuhai industrial park in 2022, which has an area of over 200 000 square meters for a total investment of US\$1.55 billion. Geek will produce in this new Zhuhai facility various kinds of ENDS (open systems, as well as D-ENDS). (14)

Prevalence of D-ENDS

Prevalence data is only starting to emerge. Surveillance systems have been slow to adapt to the very rapid changes in product development and market availability. Further, in many surveys various ENDS generations are still not differentiated, as they should be.

Some recent surveys are summarized below. We should stress that in all of them D-ENDS prevalence was significantly on the rise and for most other products (HTPs, snus, nicotine pouches) prevalence had increased, and that no significant decrease was observed in cigarettes prevalence.

Table 2: Most recent D-ENDS prevalence surveys in young people.

Year of the survey	Country	Main results
2022	Australia (15)	Among 15- to 30-year-olds, current ENDS users were 14% or having used e-cigarettes in the past (33%). D-ENDS were most popular, used by 60% of ENDS users and with especially high rates among younger users (80% of 15- to 21-year-olds compared with 49% of 22- to 30-year-olds).
2022	France (16)	Among 13–16-year-olds, 13% have already tried D-ENDS and 9% have already bought them.
2022	Sweden (17)	Among 15–16-year-olds regular D-ENDS consumption was 20% and among 17-18 this was up to 40%.
2022	Switzerland (18)	Among 14-17 years olds regular D-ENDS consumption was 9% and among 18-25 years old it was 13%.

Year of the survey	Country	Main results
2022	Switzerland (19)	In the last Swiss round of WHO's Health Behaviour in School-aged Children (HSBC), among 14–15-year-olds regular consumption of ENDS was 21%.
2022	USA (20)	In 2022, 14.1% of high school students and 3.3% of middle school students reported current ENDS use. Among current ENDS users, 42.3% reported using ENDS frequently, including 46.0% of high school students and 20.8% of middle school students; daily use was reported among 27.6% of current ENDS users, including 30.1% of high school students and 11.7% of middle school students. Main ENDS used were D-ENDS.
2021-22	UK(21)	From January 2021 to April 2022, there was an 18-fold increase in the number of vapers using D-ENDS, rising from 1.2% to 22.2%. Growth in D-ENDS was most pronounced in younger adults: for example, the percentage of 18-year-old vapers using D-ENDS rose from 0.4% to 54.8%

Marketing of disposable cigarette,

Marketing of so-called newer products (snus, nicotine pouches, ENDS, D-ENDS, HTPs) use a variety of marketing techniques. D-ENDS appears to target mostly younger people through social media channels like FB, TikTok, Instagram, etc. In the UK, TikTok is used by half of eight to 11-year-olds and three-quarters of 16 to 17-year-olds. The marketing “mix” can change from country to country.

Social media is widely used by young people with user-generated content. Influencer marketing is particularly influential in promoting products. Of concern is the fact that the vast majority of YouTube and Instagram content about ENDS promotes their use, and typically the content does not contain age and/or health warnings. These findings may highlight a priority for governmental policy to restrict the ability of marketers to reach youths with social media content promoting ENDS. (22) Social media marketing is sometimes linked to industry paid influencers which makes it even more difficult to follow and distinguish between paid and non-paid content. Some industries appear to run well-funded and planned marketing campaigns, mixing marketing methods, including the use of influencers, and print or online articles.



Image 2: D-ENDS advertisement in TikTok, The Guardian, 17.07.2022

An investigation in the UK recently revealed that Chinese-owned brand Elf Bar is fuelling the boom in D-ENDS among young people as social media influencers on TikTok promote its goods in an apparent breach of advertising rules. (23)

D-ENDS products themselves use shape, design, colours, and flavours to attract a young customer base.



Image 3: some examples of D-ENDS particularly aiming young people.

D-ENDS flavourings play a particularly important role in their appeal to youth. The flavour “tobacco” is seldom used. Most flavours are fruity or sweets, with often an addition of menthol or “icing” flavours. (24) The very common brand Elf bar 600 is normally available in at least 40 different flavours, with new flavours constantly appearing. Some examples of flavours are apple peach, banana ice, blue razz lemonade, cherry cola, classic cola, energy ice, lemon tart, kiwi passion fruit guava, strawberry energy, watermelon bubble-gum, etc. Some flavours are an improbable new mix with a strange name, like the “Elf Berg” which is described as mixing “a selection of juicy-tasting berry notes with icy menthol, for a vape that’s as fruity as it is frosty”. Special flavours are produced for special occasion in “limited” offers, for instance for the 2022 Christmas holidays, Elf bar produced flavours like cinnamon orange, red velvet cake or chocolate brownie cookies for some

European markets. It is noteworthy that China has banned the sale of electronic cigarettes with non-tobacco flavours since 1 October 2022. (4)

Health and environmental impact

Disposable ENDS pose a major environmental threat. They contain plastic, metals, toxic e-liquids, and also a battery (usually ion-lithium), which are typically improperly disposed. While the battery could theoretically be recharged, the devices are designed to be thrown away after the e-liquid content is consumed.

Producers and distributors have made limited efforts to inform consumers on how to properly dispose of their D-ENDS products. Where such information exists, it is scant, poorly visible, sometimes wrong, and incomplete. Very few distributors accept the return of used devices, and it is unclear how they dispose of them if they collect them. Most, if not almost all, such devices end up either in the environment or in normal rubbish (household rubbish) and not in special toxic electronic rubbish, as they should. (25) In the UK, research from the recycling group Material Focus claims that 1.3 million single use vapes are being thrown away every week. That means every year 10 tonnes of lithium batteries inside the electronic cigarettes are also being discarded — that's the same amount of lithium needed for 1200 electric car batteries. (26)

D-ENDS are single use plastic and electronic devices that should, if possible, be banned from the market, for environmental reasons. If not banned, a compulsory recycling system should be enforced by governments.

NB: in this document we are not discussing the health risks of ENDS, D-ENDS, or their possible risks compared with other nicotine and tobacco products. We simply note that evidence showing their negative health and environmental impact is growing. (27)

Research gaps

Many research gaps exist regarding disposable ENDS and ENNDS.

Chemical analysis: an important aspect to be considered is their extreme heterogeneity and diversity: while D-ENDS devices are relatively simple and easy to produce, their chemical contents are poorly analysed. Chemical analysis of the liquids and of the aerosols generated by their consumption should be carried out. Liquids heated at high temperatures are creating novel and poorly understood chemical compounds. When a D-ENDS is exhausting its e-liquid, the metal coil appears to be heating more and more. How this is affecting the aerosol generated by the D-ENDS has not been studied. Flavouring chemicals are also poorly understood, and more research is needed on their specific toxicity.

Health impacts: increasing evidence of the health impacts of these products is emerging, however there are still many gaps in the medium- to long-term. D-ENDS allows a strong intake of nicotine (very often nicotine salt and synthetic nicotine are used in these products) in a very short time (to get a “hit”) and young people could hyperventilate with a D-ENDS. Nicotine has specific health

implications for young people, particularly in relation to the development of addiction, but how this stronger intake can affect young people's physical health is still being researched.

Surveillance and monitoring: monitoring efforts to clearly differentiate prevalence of different products (i.e. differentiating between open systems ENDS, pods ENDS and disposable ENDS), started only recently so surveillance data is scant. Multiple products' prevalence and interaction among product consumption is often insufficiently considered.

Market surveillance: markets are evolving very rapidly and there is an urgent need to follow their evolution. What products are available in different markets? How have big producers adapted their marketing strategies? How are prices evolving? Commercial determinants of health should be fully integrated in public health strategies.

Policy analysis: many policies effective against tobacco should be implemented against disposable ENDS as well (plain packages, flavour bans, taxation, full advertisement bans, selling only under a licence system, etc.) However, regulation and policies often differ between tobacco or ENDS products. What is the impact of policy differences? How should ENDS and D-ENDS, if allowed on the market, be taxed in comparison to other nicotine and tobacco products?

References

1. <https://vapesourcing.com/15000-puffs.html> (consulted on 16.04.2023)
2. Hickman E, Jaspers I. 2022. Evolving chemical landscape of e-cigarettes, 2021. In *Tob Control* 31 (e1), e1-e2. DOI: 10.1136/tobaccocontrol-2021-056808.
3. Krüsemann E J Z, Boesveldt S, Graaf Kees de, Talhout R. 2019: An E-Liquid Flavor Wheel: A Shared Vocabulary Based on Systematically Reviewing E-Liquid Flavor Classifications in Literature. In *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco* 21 (10), pp. 1310–1319. DOI: 10.1093/ntr/nty101.
4. Das S, Unguod-Thomas J, Luis Y. 2022. China bans fruity vapes – but not their export to the UK. Popular disposable brand will still be able to sell products in Britain, despite being accused of flouting advertising regulations. In *The Guardian*, 10/16/2022. Available online at <https://www.theguardian.com/society/2022/oct/16/china-bans-fruity-vapes-export-disposable-brand-britain>.
5. <https://profglantz.com/2021/11/03/47-countries-have-banned-e-cigarettes/> (consulted on 31.03.2023).
6. <https://mrvapes.mx/products/elf-bar-bc-5000-hits> and <https://podstorebrasil.com/collections/elfbar> (consulted on 07.04.2023).
7. <https://ovape-lebanon.com/brand/elfbar/> (consulted on 07.04.2023).
8. <https://www.theguardian.com/society/2023/mar/21/tighter-import-bans-on-e-cigarettes-expected-in-bid-to-tackle-explosion-in-vaping> (consulted on 07.04.2023). See also Freeman, B (2023): Reigniting tobacco control: returning Australia to the front of the pack. In *Public health research & practice* 33 (1). DOI: 10.17061/phrp3312304.
9. <https://tobaccoreporter.com/2023/03/01/elbar-to-rebrand-as-eb-design/> (consulted 16.04.2023).
10. <https://thefinancialexpress.com.bd/trade/78pc-of-e-cigarette-outlets-opened-in-five-years-study> (consulted on 07.04.2023).
11. <https://www.grandviewresearch.com/industry-analysis/disposable-e-cigarettes-market-report> (consulted on 07.04.2023).
12. https://www.made-in-china.com/products-search/hot-china-products/Disposable_Vape.html (consulted on 07.04.2023).
13. <https://www.at-schweiz.ch/at-blog/disposable-electronic-cigarettes> (consulted on 07.04.2023)
14. finanzen.ch (12/7/2022): Geekvape's Super Factory: Intelligence leads the rapid development of the e-cigarette industry. And <https://www.geekvape.com/news/industrial-park.html> (consulted on 08.04.2023).
15. Pettigrew S, Miller M, Alvin Santos J, Raj T S, Brown K, Jones, A. 2023. E-cigarette attitudes and use in a sample of Australians aged 15-30 years. In *Australian and New Zealand Journal of Public Health*, p. 100035. DOI: 10.1016/j.anzjph.2023.100035.
16. Alliance contre le Tabac (10/25/2022): 1 ado sur 10 a déjà utilisé la Puff. L'ACT réclame l'interdiction immédiate des cigarettes électronique jetables. Perception et usage de la Puff chez les 13-16 ans. Available online at <https://alliancecontretabac.org/2022/10/25/1-ado-sur-10-a-deja-utilise-la-puff-lact-reclame-son-interdiction/>.
17. Zetterqvist, Martina (2022): CAN:s nationella skolundersökning 2022. Ungas erfarenheter av alkohol, narkotika, doping, tobak och spel. Centralförbundet för Alkohol- Och Narkotikaupplysning (CAN). Stockholm (CAN, 215). Available online at <https://www.can.se/publikationer/cans-nationella-skolundersokning-2022/>.
18. Chok L, Cros J, Lebon L, Zürcher K, Dubuis A, Berthouzoz C, et al. 2023. Enquête sur l'usage et les représentations des cigarettes électroniques jetables (puffs) parmi les jeunes romand-es. Unisanté – Centre universitaire de médecine générale et santé publique. Lausanne (Raisons de santé, 344). Available online at <https://www.unisante.ch/fr/formation-recherche/recherche/publications/raisons-sante/raisons-sante-344>.
19. Delgrande JM, Balsiger N, Schmidhauser V. 2023. La consommation de substances psychoactives des 11 à 15 ans en Suisse – Situation en 2022 et évolution dans le temps – Résultats de l'étude Health Behaviour in School-aged Children (HBSC). Rapport de recherche No 149. Addiction Suisse. Lausanne (Rapport de recherche, 149). Available online at <https://www.addictionsuisse.ch/press/consommation-de-tabac-et-de-nicotine-chez-les-jeunes-letude-nationale-aupres-des-eleves-revele-une-evolution-inquietante/>.
20. Centers for Disease Control and Prevention. 2022. E-cigarette Use Among Middle and High School Students — United States, 2022. In *Morbidity and Mortality Weekly Report MMWR* 71 (40), pp. 1283–1285. Available online at https://www.cdc.gov/mmwr/volumes/71/wr/mm7140a3.htm?s_cid=mm7140a3_w.
21. Tattan-Birch H; Jackson S E, Kock L, Dockrell M, Brown J. 2022. Rapid growth in disposable e-cigarette vaping among young adults in Great Britain from 2021 to 2022: a repeat cross-sectional survey. In *Addiction*. DOI: 10.1111/add.16044.

22. Smith M J, Buckton C, Patterson C, Hilton S. 2023. User-generated content and influencer marketing involving e-cigarettes on social media: a scoping review and content analysis of YouTube and Instagram. In *BMC Public Health* 23 (1), p. 530. DOI: 10.1186/s12889-023-15389-1.
23. <https://www.theguardian.com/society/2022/jul/17/chinese-vaping-giant-flouting-uk-advertising-rules-on-selling-to-children> (consulted on 08.04.2023)
24. Notley C, Gentry S, Cox S, Dockrell M, Havill M, Attwood AS, et al. Youth Use of E-Liquid Flavours - A systematic review exploring patterns of use of e liquid flavours and associations with continued vaping, tobacco smoking uptake, or cessation. *Addiction* 2021.; Krüsemann, Erna J. Z.; Boesveldt, Sanne; Graaf, Kees de; Talhout, Reinskje (2019): An E-Liquid Flavor Wheel: A Shared Vocabulary Based on Systematically Reviewing E-Liquid Flavor Classifications in Literature. In *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco* 21 (10), pp. 1310–1319. DOI: 10.1093/ntr/nty101.
25. Chapman M, Johnston F. 2022). Lithium being trashed by the tonne as disposable vapes flood the US market. In *The Bureau of Investigative Journalism* (en-GB), 12/15/2022. Available online at <https://www.thebureauinvestigates.com/stories/2022-12-15/lithium-being-trashed-by-the-tonne-as-disposable-vapes-flood-us-market> , checked on 1/19/2023. And Chapman, Matthew (2022): Rise of single-use vapes sending tonnes of lithium to landfill. In *The Bureau of Investigative Journalism* (en-GB), 7/15/2022. Available online at <https://www.thebureauinvestigates.com/stories/2022-07-15/rise-of-single-use-vapes-sending-tonnes-of-lithium-to-landfill> , checked on 1/19/2023.
26. <https://www.itv.com/news/2023-03-08/calls-for-disposable-vapes-ban-over-littering-concerns> (consulted on 08.04.2023)
27. Banks E, Yazidjoglou A, Brown S, Nguyen M, Martin M, Beckwith K et al. 2023. Electronic cigarettes and health outcomes: umbrella and systematic review of the global evidence. In *The Medical journal of Australia* 218 (6), pp. 267–275. DOI: 10.5694/mja2.51890.