



# Designed to break: planned obsolescence as corporate environmental crime

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## Abstract

Planned obsolescence is the practice of deliberately designing products to limit their life span to encourage replacement. It is a common business strategy for consumer goods, with far-reaching ecological and social consequences. Here, we examine the definition, causes and consequences of planned obsolescence by using insights from corporate crime literature, integrated with environmental philosophy, management sciences, technology studies and law. Focusing on cases of planned obsolescence in consumer electronics, we show that the concept and procedure carries conceptual ambiguity and moral ambivalence, bearing diffuse harms, benefitting short-term corporate profit but undermining consumer confidence, and posing a major barrier to environmental sustainability. We discuss the system lock-ins driving companies to engage in planned obsolescence, and reframe the practice as a form of corporate environmental crime.

**Keywords** White-collar crime · Electronic waste · Planned obsolescence · Circular economy · Corporate crime · Environmental crime

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## Introduction

In December 1924, the world's largest producers of light bulbs (*Philips*, *General Electric*, *Osram*, and *Compagnie des Lampes*) colluded to artificially limit the lifespan of their products. The 1924 market standard of 2,500 burning hours was reduced to 1,000 by 1940, far below the multi-decade intended lifespan for incandescent light bulbs invented by Thomas Edison and Adolphe Chaillet. This event, better known as the *Lightbulb Conspiracy* (Dannoritzer, 2010) or the *Phoebus*<sup>1</sup> *Cartel* (Blanken, 1999; Metze, 2012), marks the emergence of *planned obsolescence*.

Planned obsolescence entails the deliberate design of products to artificially limit their lifespan—either actual or perceived functionality—encouraging or requiring consumers to replace products prematurely (Sherif & Rice, 1986, p. 75). Light bulb producers originally used this strategy to increase their product turn-over and thus profitability, while New York real estate magnate Bernard London (1932, p. 2) went a step further by proposing a national policy of planned obsolescence to restore the US economy following the 1929 Wall Street crash. Robust products became economic liabilities in a Depression economy, and London proposed products be declared ‘legally dead’ after a predetermined period, after which they would be collected and destroyed by the state. In exchange, consumers would receive the item’s original sales tax value as a voucher for a new purchase, stimulating consumption and contributing to jobs in manufacturing.

Although London’s proposal was initially regarded as controversial and unpopular (Wong, 2012), planned obsolescence was championed in the ‘Throw-Away Society’ campaign to counter the post-war economic crisis in the United States and Europe (Adamson, 2003). Consumer products were designed and advertised to be “a little newer, a little better, a little sooner than is necessary” (Brooks Stevens quoted in Adamson, 2003, pp. 4–5), resulting in ever-shortening cycles of popular trends intended to decouple obsolescence from actual usefulness, yoking it to consumer perception. Combining perceived obsolescence with planned obsolescence has proven a powerful driver of consumption, increasingly unsustainable as populations multiplied and the practice globalized.

Corporations usually close ranks around their common business strategy of planned obsolescence. Due to this lack of transparency, the public becomes aware of examples chiefly through whistle-blowers, such as *The Repair Association* and ‘right to repair’ movement in the US, or via lawsuits filed by displeased consumers, NGOs and states. The following cases illustrate in which ways planned obsolescence is constituent to contemporary consumer production practices.

Well-known examples of planned obsolescence present in consumer products are those of printers and ink cartridges (Amandam, 2020). In 2006, a class action suit was settled about *Epson* inkjet printers that suspended the printer function even when cartridges were not yet empty.<sup>2</sup> *Epson* denied all claims about breach of contract and

<sup>1</sup> *Phoebus S.A. Compagnie Industrielle pour le Développement de l’Eclairage*.

<sup>2</sup> The plaintiffs’ claim against Epson America alleged: “breach of contract, breach of implied warranties, unjust enrichment, fraudulent concealment, violations of California Business and Professions Code Sect. 17200, et seq., and violations of the California Consumers Legal Remedies Act, California Civil

implied warranties, unjust enrichment, fraudulent concealment and other violations of California State Law but settled to avoid further litigation and paid coupons of \$45 USD to consumers who bought their products between 1999 and 2006. In 2010, three US class action suits<sup>3</sup> about unfair business practices—Hewlett Packard (HP) failed to disclose and/or misrepresented facts about its ink cartridges and printers<sup>4</sup>—were settled by HP, because a ‘smart chip’ indicated that ink cartridges needed replacement long before they were empty and rendered printers inoperable, even for tasks that did not require ink. HP settled by issuing coupons of \$2, \$5 or \$6 USD for each claimant and changing the pop-up messages about ink cartridges, for a settlement totalling about \$5 million USD. In 2015, Canon paid \$930,000 USD in a settlement about malfunctioning printer heads, but denied wrongdoing.<sup>5</sup> In 2017, several printer producers (e.g. HP, Canon, Brother, Epson) were sued by the French non-profit *Halte à l’Obsolescence Programmée* (HOP) for business practices that forced consumers to spend more on repairs and harmed the environment.<sup>6</sup> These companies were fined 15,000 euros each. In 2018, another class action was settled by HP for \$1.5 million USD regarding fake error messages for their printers.<sup>7</sup>

Mobile phone producers have been confronted with lawsuits and authority decisions about their planned obsolescence strategies (Gibbs, 2018; Vasseur, 2020). In 2017, the Italian Competition Authority (Autorità Garante della Concorrenza e del Mercato (AGCM)) imposed 5 million euro fines to Apple and Samsung for unfair commercial practices, with Apple receiving an additional 5 million euro fine for failing to properly inform consumer (Malinauskaite & Erdem, 2021). Apple argued that intentionally slowing down older iPhones via software updates was necessary to avoid unforeseen shutdowns, even though such a program would disable the utility of a device well before its physical product lifetime. Apple denied intentionally aiming to shorten the lifetime of the product (White, 2017). Samsung denied the accusations altogether and announced it would appeal the ruling (Gibbs, 2018). The French lawsuit against Apple, once again filed by HOP, resulted in a 25 million euro fine for deliberately slowing down iPhones via software updates which forced consumers to replace the battery<sup>8</sup> or purchase a new phone (Vasseur, 2020). In March 2021, the Portuguese consumer organization *Deco Proteste* filed a class action for 115,000

Code Sect. 1750, et seq., relating to the performance and other characteristics of Epson inkjet printer cartridges” Source: <http://www.epsonsettlement.com/>.

<sup>3</sup> Ciolino v. Hewlett-Packard Co., Case No. 5:05-cv-03580-JF; Rich v. Hewlett-Packard Co., Case No. 5:06-cv-03361-JF; Blennis v. Hewlett-Packard Co., Case No. 5:07-cv-00333-JF. These three class were consolidated in one suit (In re: HP Inkjet Printer Litigation, Case No. 5:05-cv-03580-JF (N.D. Cal. Sep. 30, 2014)).

<sup>4</sup> In re HP Inkjet Printer Litigation, Case No. 5:05-cv-03580-JF, 2 (N.D. Cal. Sep. 30, 2014).

<sup>5</sup> <https://topclassactions.com/lawsuit-settlements/lawsuit-news/58464-canon-reaches-class-action-settlement-over-printer-defect/>.

<sup>6</sup> <https://www.halteobsolescence.org/les-fabricants-dimprimantes-mis-en-cause-par-une-plainte/>

<sup>7</sup> The HP Ink Cartridge Monopoly Class Action Lawsuit is In re: HP Printer Firmware Update Litigation, Case No. 5:16-cv-05820-EJD, in the U.S. District Court for the Northern District of California, San Jose Division.

<sup>8</sup> Apple forces replacement of batteries in their products to be performed in Apple repair centers or else the product warranty is voided.

iPhone users claiming that “Apple deliberately manipulated, and without informing its users, the performance of its most popular devices, the iPhone 6, 6 Plus, 6S, and 6S Plus”.<sup>9</sup> Similar class action lawsuits had been filed in Belgium, Italy and Spain in 2020 and 2021, coordinated by consumer cluster organisation Euroconsumers. At the time of writing this article, there were no updates about these class actions (Euroconsumers, 2021).

As is evident from these and other examples, planned obsolescence is commonly used in the market of consumer electronics. Particularly mobile phones and tablets are known for serial changes of charging and data ports requiring new cables rendering the old ones obsolete, firmware upgrades crippling the speed of last year’s devices, and pairing launches of proprietary *Bluetooth* earbuds (such as *Apple*’s expensive, short lifespan, “disappointingly disposable”<sup>10</sup> *AirPods*) through removing audio jacks.

Whereas the *planned* obsolescence examples of *Apple*, *Samsung* and *HP* involved products designed to fail reliably after a certain amount of time, effectively limiting the *lifespan* of products, many of these and other companies also use a strategy of *perceived* obsolescence. Perceived obsolescence—also referred to as style or psychological obsolescence—happens when consumers are encouraged to replace products using fashion and other aesthetic or status concerns even though they function perfectly well (Gregory, 1947; Maycroft, 2009). Producers launch new products at a quick succession each with slight (often cosmetic only) improvements to create a treadmill of short-lived but much hyped product desirability and thereby consumption (Wrbka & DiMatteo, 2018). Take for instance the global rise in ‘fast fashion’ with some fashion stores advertising 24 micro-seasons per year rather than two (spring/summer and winter/fall), with consumers discarding garments twice as quickly as 15 years prior (Remy et al., 2016; Whitehead Lorh, 2014). In the consumer electronics sector, manufacturers have a tried-and-true business strategy of frequently updating the style of their products to promote perceived aging, resulting in premature discarding of products (Maycroft, 2009). As MacBride (2010, p. 171) has written, “The distancing of products from strict usefulness and their grafting onto ‘ways of life’ have, as market economies must, grown at ever increasing rates. Today, not so much products but cultural concepts are marketed.” With perceived obsolescence, responsibility is shared between producers, marketers and consumers. Whereas in (material) planned obsolescence, producers play an active role. The focus of this article is therefore on this latter type of planned obsolescence, also known as built-in, physical, design or programmed obsolescence.

Management science has a long tradition of studying planned obsolescence as an economic theory (Bulow, 1986), a business strategy (Iizuka, 2007) and a case for business ethics (Guiltinan, 2009). The focus of legal scholars on the topic is more recent and trails both the legal development of class action suits about planned obsolescence and the legislative initiatives in some countries to ban planned obsolescence. Scholars for instance discussed the legal implications of settling to pay class action settlements in coupons valid only for purchasing products from the company

<sup>9</sup> <https://9to5mac.com/2021/03/01/apple-lawsuit-portugal-planned-obsolescence/>.

<sup>10</sup> <https://nl.ifixit.com/Teardown/AirPods+2+Teardown/121471>.

that plaintiffs sued in the first place (Connolly, 2016; Gallagher, 2015). Other studies centre around the question of which legal responses—competition law, consumer protection law, environmental law or criminal law—are the most adequate to regulate planned obsolescence (La Rosa, 2020; Maitre-Ekern & Dalhammar, 2016; Malinauskaitė & Erdem, 2021), or place planned obsolescence within the political and economic historical climate in which it developed (Pope, 2017).

While the subject of planned obsolescence has been discussed quite extensively within business literature and has recently gained traction in law, to our knowledge, planned obsolescence has not been studied in criminology. Planned obsolescence has been used as a metaphor by green criminologists Brisman and South (2013) to summarize how humanity has (mis)treated Planet Earth. Also, the environmental consequences of wasteful consumption (Lynch et al., 2019; Smith & Brisman, 2021) and particularly of electronic waste have been well-documented (Bisschop, 2012; Gibbs et al., 2010). The role of producers and the interplay between consumers and producers has, however, been under-scrutinized except for being called a push factor for illegal e-waste trade and substandard disposal (Bisschop, 2012). Less attention is thus directed to the theoretical question whether planned obsolescence could be considered a form of corporate crime, which this article intends to present. We discuss the drivers and consequences of planned obsolescence by using corporate crime literature as a frame of analysis, integrated with insights from environmental philosophy, management sciences and law.

Our analysis focuses on planned obsolescence in consumer electronics, as these products are especially vulnerable to this sort of manipulation. Because of their predetermined breaking points (*Sollbruchstelle*), planned obsolescence can be literally programmed into electronic (especially networked) devices. Before starting our criminological analysis of planned obsolescence in consumer electronics, we explain our analytical framework. The article then continues by discussing how the conceptual ambiguity and moral ambivalence applies to planned obsolescence, after which the harms related to planned obsolescence will be discussed. Then the article focuses on how corporations, consumers and society as a whole play a role in the emergence and continuation of planned obsolescence. This brings us to a discussion of how planned obsolescence relates to (non)compliance with socio-economic policy, and, finally, a conclusion.

## Analytical framework

Attention to the crimes and other harmful behaviours committed by respectable people and organizations has slowly but steadily increased since Sutherland coined the term ‘white-collar crime’ (1945). Other scholars before him had already brought attention to crimes committed in business suites rather than a preoccupation with street crimes (Bonger, 1916; Taylor et al., 1971). The debate about what constitutes white-collar crime and how it can be measured, explained and prevented continues (Simpson, 2019). In this article, we use the concept of white-collar crime in the traditional sense—“the illegal and harmful actions of elites and respectable members of society carried out for economic gain in the context of legitimate organizational and

occupational activity” (Friedrichs, 2019, p. 25)—as this definition addresses issues of inequality and power, especially regarding societal attention, fear, and shame (Barak, 2015). More specifically, we focus on corporate crime, a sub-type of white-collar crime, that emphasises the corporate context in which the illegal activity takes place, and we focus particularly on the environmental impact of planned obsolescence.

Literature on corporate crime identifies four key characteristics, deployed here as a frame of analysis to discuss planned obsolescence (van de Bunt, 1992; van de Bunt & Huisman, 1999).

The first key characteristic is the conceptual ambiguity and moral ambivalence that is typical for corporate crime. Many harmful business practices are not perceived as criminal nor punished as criminal offences (Friedrichs, 2009; Geis, 1987; Passas, 2005; Passas & Goodwin, 2004).

Second, corporate crime has diffuse victims and harms. Although often there is noticeable damage to the environment or to human health, harm is often immaterial in absence of direct claimants for the harm, and might even mostly constitute a violation of trust (Van de Bunt & Huisman, 2004; van Wingerde, 2015).

Third, corporate crime is committed by and for the benefit of a company (Clinard & Yeager, 1980) while other forms of white-collar crime (e.g. occupational crime) focus more on personal gain or focus on other powerful actors in society such as states (e.g. state-corporate crime) or organized crime groups (e.g. enterprise crime) (Friedrichs, 2019, pp. 26–27).

Finally, corporate crime concerns non-compliance within the socio-economic domain, referring to (often repeated) violations of environmental, labour, competition or fiscal law (Sutherland, 1983). Investigation and prosecution of these violations requires specific professional expertise, which, in Europe, often rests with administrative agencies, bearing serious implications for measurement and comparative analysis of non-compliance (Wall-Parker, 2019). This article continues by discussing how each of these criteria applies to planned obsolescence, starting with conceptual ambiguity and moral ambivalence.

## Conceptual ambiguity and moral ambivalence

While various scholars agree that white-collar crime is best used as an ‘umbrella’ concept which encompasses a suite of behaviours by diverse actors (Friedrichs, 2019, p. 18), continuous disagreement persists regarding what does and does not fall under the notion of ‘crime’. Similar discussions underpin many studies about corporate crime (Gibbs & Simpson, 2009). Sutherland (1945) considered all law violations—whether criminal or other—substantive for crime, whereas Tappan (1947) included only criminal law violations in his definition. Others go beyond these legalistic approaches to crime and focus on harmful behaviour that is not necessarily regulated by law (Hillyard et al., 2004) and might even be normalized business behavior (Lynch et al., 2016). With the subject of planned obsolescence, we find ourselves in this area of tension between crime and harmfulness. We start our conceptual exploration in literature, building on specific examples in consumer electronics, and then turn to policy definitions.

Contrastive concepts have been used in literature to define planned obsolescence. Even focusing solely on the physical, built-in form of planned obsolescence in which the lifespan of a product is deliberately shortened so that consumers have to re-purchase it more often (Bulow, 1986; Gregory, 1947)—thus disregarding perceived (style or psychological) obsolescence—planned obsolescence is multifaceted (Malinauskaitė & Erdem, 2021): it occurs because the hardware fails, because the software makes the product unusable, or because repairs become (virtually) impossible.

As for the hardware, parts might be deliberately produced in fragile or flimsy ways, with the result that after a honeymoon period, covered under a warranty, the entire product no longer functions. The paradox, however, is that especially for high brand value products, the product must initially work excellently, being the best in class. The premature aging process through calculating and planning when various circuit-breakers in the product shall fail, reliably renders the product useless or less useful after a certain predetermined date, even if often only one aspect or component of the product truly breaks (Solomon et al., 2000). Engineering a product's premature aging already happens in the design phase and is therefore a direct form of planned obsolescence. This strategy was applied, for example, in the 1950s and 1960s for portable radios, for which a premature lifespan of three years was set (Guiltinan, 2009). Such sales practices have carried on with home printers, such as the *Epson Stylus D68* (now discontinued) which had an immobilizing chip that, once the specified number of pages was printed, made the printer unusable no matter the condition or state of the actual hardware (Vallauri, 2012). *Epson* (n.d.) explained this sudden defectiveness simply, stating that the “components have reached the end of their usable life.”

While originally hardware itself was manufactured with a predetermined material *Sollbruchstelle* (or circuit breaker), planned obsolescence is now routinely programmed into the software of electronic devices and remotely activated. Regular updates and continuous software improvements in consumer electronics are necessary both for continued consumer use and for the company to stay relevant as lifestyles or interests change. Older devices are often not compatible with the software updates and might become functionally over-programmed or practically unusable (become too slow, experience frequent crashes, etc.) (Maycroft, 2004). Whether this ironic misfortune of updates is deliberate or not, the consistent outcome of diminished utility is the same. Critical technologist Cory Doctorow has described software obsolescence as a potential “arm-breaker” loan-shark technique of “bricking” or sequentially shutting down user ability of networked electronics (such as laptops, smartphones, or electric cars) if users do not comply with subscription payments (Doctorow, 2021). Similarly, “lock-in” policies—which disable making use of software from other suppliers—limit functionality and encourage the purchase of a new product of the same brand. In the US, mobile network providers play their part in encouraging consumers to purchase new products by locking devices indefinitely to their own network (Ofcom, 2020), arguably making resell and use of second-hand phones problematic for consumers.

What also falls under built-in planned obsolescence—albeit less directly—is the difficulty of making repairs. For many products, the availability of parts is limited in time or so expensive that repairs are not cost-effective (Solomon et al., 2000). Moreover, many producers make their repair services difficult to access, which means that



repairs require a lot of time and energy from the consumer (Aladeojebi, 2013). Sometimes home or hobby repair is impossible because the product cannot be dismantled without damaging it or because nobody has the expertise to carry out the repair. For example, *Apple's iPhone 11* batteries are difficult to replace without causing significant damage to the product and without the necessary technical expertise and equipment to take you through the 44 step process (Suovanen, 2019). Even if the battery replacement is successful, a warning message will appear on the battery health indicator in the settings menu. This is due to a microprocessor in the battery *Apple* introduced in their models since *iPhone XS* in 2018 (Apple Support, n.d.) to monitor its overall performance, which only the company itself or company approved repair centres can configure. If the consumer opts to either replace the battery themselves or use a third-party repair shop, the annoying and distressing message will appear as a constant reminder (Apple Support, n.d.). Arguably, *Apple* seeks to discourage these practices, thereby directing consumers to either replace the phone or choose a repairing venue profitable for *Apple*—their licensed repair shops (News, 2019).

While literature has typologized and interpreted planned obsolescence inconsistently with variation both within and between disciplines, legal definitions of planned obsolescence are few and imperfect. There are no clear standards to distinguish acceptable durability design from fraudulent or criminal planned obsolescence (Koolhoven & Heerema, 2018, p. 35).

France is the first and so far only country that has explicitly addressed planned obsolescence by defining, prohibiting and penalizing it via the ‘Consumer Code’ [*Code de la Consommation*] (La Rosa, 2020).<sup>11</sup> It defines planned obsolescence [*l’obsolescence programmée*] as ‘the use of techniques by which the person in charge of placing a product on the market aims to deliberately reduce its lifespan in order to increase its replacement rate’ (own translation of article L.422-2 of the Consumer Code)<sup>12</sup>. This was paired with addressing repairability as consumers were provided with the right to know for how long spare parts would be available and to have them delivered within two months (Koolhoven & Heerema, 2018, p. 37). Manufacturers—or importers who put the product on the French market—found guilty of this can receive a fine of 300,000 euro (or up to 5% of the average yearly turnover of the last 3 years) and up to a 2 year sentence (La Rosa, 2020, p. 225; Article L454-6). When assessed based on the legality principle, it is not clear whether this definition includes omissions and neither is it clear how the deliberate reduction of the lifespan can be proven in court (La Rosa, 2020, p. 230). It is up to the consumer to prove that the planned obsolescence was a deliberate practice. In a 2018 report, the French government also acknowledges the challenge of defining planning obsolescence clearly and in 2021 it formulated further recommendations to avoid product obsolescence, this time targeting software-induced obsolescence [*l’obsolescence logicielle*].<sup>13</sup>

<sup>11</sup> LOI N° 2015-992 Du 17 Août 2015 Relative à La Transition Énergétique Pour La Croissance Verte—Article 99, 2015.

<sup>12</sup> Original text: “‘Est interdite la pratique de l’obsolescence programmée qui se définit par le recours à des techniques par lesquelles le responsable de la mise sur le marché d’un produit vise à en réduire délibérément la durée de vie pour en augmenter le taux de remplacement.”

<sup>13</sup> GOUVERNEMENT FRANÇAISE, Rapport du Gouvernement au Parlement sur l’obsolescence programmée, sa définition juridique et ses enjeux économiques, p. 9, [ecologie.solidaire.gouv.fr/sites/](https://ecologie.solidaire.gouv.fr/sites/)



Many other countries in Europe and elsewhere are concerned about the issue as demonstrated by various policy and regulatory initiatives focused on warranty, consumer rights or repairs, but have not legally defined planned obsolescence (Malinauskaitė & Erdem, 2021). Sweden facilitates repair and recycling by reducing VAT rates and allowing tax deductions of labor costs for repairs, while also more aggressively taxing products that are difficult to recycle (La Rosa, 2020, p. 229). The Netherlands, Austria and Finland have taken measures to improve consumer rights in terms of warranty (Wrbka & DiMatteo, 2018). As illustrated already in the cases of *Samsung* and *Apple*, Italy chose an administrative route to regulate and sanction unfair commercial practices (La Rosa, 2020, p. 228).

EU policy has also addressed planned obsolescence—albeit initially in an implicit manner—via policies on waste, use of natural resources, consumer information and circular economy (La Rosa, 2020). The EU's legal framework on waste, and especially e-waste<sup>14</sup>, aims to better 'mine' the secondary raw materials from the consumer product market (Bisschop, 2013). The EU's 2015 Circular Economy Action Plans<sup>15</sup> aimed to make consumer goods more durable, easier to repair and stimulate the circular economy by 'decoupling economic growth from resource use' (Malinauskaitė & Erdem, 2021, p. 11). In 2017, the European Parliament passed a resolution, urging the European Commission to focus on addressing planned obsolescence via harmonization (Article 14 TFEU) to improve the functioning of the EU's internal market.<sup>16</sup> Although this resolution carries moral importance, no regulatory initiatives have followed, which would first require the EU to define planned obsolescence. On 11 March 2020, the Commission's New Circular Economy Action Plan, exploring possible further strengthening of consumer protection, advised against greenwashing and premature obsolescence. On 25 November 2020, the EU Parliament adopted a Resolution in which it called on the Commission to consider measures to protect consumers from premature obsolescence. On 10 February 2021 this was confirmed in the Resolution on the New Circular Economy Action Plan, referring to measures such as usage meters, uniform repair scores and digital passports for products (Šajn, 2021). In sum, planned obsolescence directly opposes the circular economy ideal, but the resolutions have yet to be implemented (Malinauskaitė & Erdem, 2021).

Within the American legal system, the Consumer Product Safety Commission which administers and enforces federal regulations regarding consumer rights, could set durability standards for products, but there are currently no federal laws that prohibit planned obsolescence. In the class action suits filed in California against *Epson*, the plaintiffs did claim there was fraudulent concealment.<sup>17</sup> In May 2019, a class

default/files/RAPPORT\_Obsolescence\_programmee.pdf, March 26, 2018. & [https://www.economie.gouv.fr/numerique-propositions-lutter-contre-obsolescence-logicielle#:~:text=Pour%20faire%20face%20%C3%A0%20cette,%C3%A9conomie%20circulaire%20\(AGEC\).](https://www.economie.gouv.fr/numerique-propositions-lutter-contre-obsolescence-logicielle#:~:text=Pour%20faire%20face%20%C3%A0%20cette,%C3%A9conomie%20circulaire%20(AGEC).)

<sup>14</sup> WEEE-Directive 2012/19/EU Waste of Electrical and Electronic Equipment.

<sup>15</sup> <https://www.europarl.europa.eu/news/en/press-room/20170629IPR78633/making-consumer-products-more-durable-and-easier-to-repair>.

<sup>16</sup> <https://www.europarl.europa.eu/news/nl/press-room/20170530IPR76313/making-durable-reparable-goods-for-consumers-and-tackling-planned-obsolescence>.

<sup>17</sup> <http://www.epsonsettlement.com/>.

action suit was filed against *Tesla* by *Model S* and *X* owners who claimed that software updates deliberately reduced the charging speed and driving range. The claim mentioned breaches of the Federal Computer Fraud and Abuse Act and the California Consumers Legal Remedies Act, as well as violations of federal and state warranty and consumer protection laws (Cissé et al., 2020). As this refers to software related to batteries—albeit car batteries instead of electronic devices—this makes clear that some cases of planned obsolescence could fall under definitions of fraud. This case was settled in July 2021 for 1.5 million USD or 625 USD for each model owner (Lambert, 2021). As these and other cases were settled, there are no court rulings that determine whether planned obsolescence indeed can be considered fraudulent concealment or computer fraud.

Also relevant are the United Nations' Sustainable Development Goals. Specifically, goal 12 is focused on sustainable consumption and production. It aims to reduce waste generation through prevention, reduction, recycling and reuse, such as by increased product lifespans. SDG 12 aimed to achieve its targets by 2020, which has been prolonged to 2030; but this is unlikely to happen unless planned obsolescence strategies are addressed (Lipton, 2021).

Current government policy, where the public interest is kept in mind, might even play a role in leaving legal leeway for business strategies of planned obsolescence. For example, the European Commission is strongly committed to fair competition within the business community. One of the chief arguments for this—alongside consumer welfare—is innovation. The prohibition against abusing the dominant position of companies (Article 102 TFEU) implies that companies should not prevent consumers from available improvements to existing products. However, it is precisely the fragmenting of innovations into a trickled roll-out that can contribute to planned obsolescence. Under the legal mantle of innovation, companies can exclude certain features from current models, reserving them for future models which will launch at a deliberate prime point in time—when parts in the older model have started to break down—to assure maximum consumer acquisition. Implementing such a strategy hedges against being called out for planned obsolescence, as companies can refer to government policies like Article 102 TFEU, arguing that it is not unlawful to innovate or improve their product, claiming that it is in consumers' best interest to get access to an updated version. At the same time, Article 102 TFEU aims to regulate monopolies and thereby encourage competition. The most unequivocal way to gain an edge in a competitive market, however, is extracting maximum profit through sales, which is further increased and assured via continuous updated product models. Thus, a tension emerges between innovation, on the one hand, and the sustainability of products, on the other.

From a purely legalistic perspective, it is not clear whether and under which circumstances planned obsolescence as a business practice constitutes a crime. It treads close to legal boundaries in environmental, competition, tax and consumer protection law—resulting in fines for some companies; but overall, the legal framework does not define planned obsolescence as a crime (with the exception of France, and even there, ambiguously so) (La Rosa, 2020; Malinauskaitė & Erdem, 2021).

Conceptual ambiguity and moral ambivalence mix in policies attempting to address planned obsolescence indirectly.

## Diffuse harms

Prevalence and harmfulness are often difficult to determine for corporate crime (Tombs & Whyte, 2009; Wall-Parker, 2019). This also applies to planned obsolescence. Information about the prevalence of planned obsolescence is difficult to come by since there is a lack of contiguous longitudinal data (Cooper, 2016). And, as a corporate trade secret with potential consumer backlash, is infrequently admitted (Slade, 2009).<sup>18</sup> Moreover, functional tests of the lifespan of products in laboratories do not necessarily correspond to the actual circumstances in which a product must function (Whyte, 2020). Some studies therefore rely on surveys from consumers about the time span between purchasing and discarding a product which mainly gives a historical picture and no insight relevant for research aimed at determining the extent of planned obsolescence in the products that are currently being sold. For example, a 1982 study by the Organization for Economic Cooperation and Development (OECD, 1982) found that product durability increased for washing machines and TVs but decreased for vacuum cleaners, while also pointing to major differences between countries. This study also noted the interplay between consumers' preliminary replacement of products and producers' encouragement of this behaviour via minor technological modifications and marketing campaigns (Cooper, 2004). Product durability discrepancies were also noted in a study on household goods and electronics in the Netherlands (Bakker et al., 2014). The lifespan of energy-requiring consumer products fell from 2000 to 2005 by 1 to 20%, except for a lifespan increase for energy-saving lamps. A refrigerator today lasts on average fourteen years and a laptop four years. Increasing the lifespan of both cannot be achieved with the same strategy, because divergent consumption patterns lie at the basis of purchases (Chen, 2013). After all, competition with other electronics exists more with fashionable consumer electronics than for domestic appliances such as refrigerators. We may already replace a laptop in the event of slower performance while we generally use a refrigerator until it irreparably breaks. Between 2000 and 2010, product lifespans for consumer electronics fell on average 10% (Bakker et al., 2014; Prakash et al., 2016). A recent report for the European Environment Agency (Bacher et al., 2020) provides an overview of product lifetimes of various consumer electronics and shoes increased for some and decreased for others: the designed smartphone lifetime has slowly increased in recent years (to two to three years) and software support is generally two years, but these averages are seldom reached because consumers replace them earlier both due to breakage by intense use and for wanting the newest model (p. 25); the actual lifetime of washing machines has decreased from 10 to 7–8 years between 2010 and 2018, with consumer expectations at 12.5 years (p. 28); actual lifetimes of televisions are 7 to 10 years, shorter than designed lifetimes, due to perceived obsolescence (p. 36). Producers even increase the lifespan of products they

<sup>18</sup> While companies are reticent to confess to strategies of artificially limiting the predetermined lifespan of a product to hasten the product lifecycle for products that must be replaced, this does not mean that there is a surfeit of evidence about the practice of planned obsolescence. Usually revealed through the process of discovery in legal cases, at this point, due to the ubiquity of evidence, planned obsolescence in its myriad forms is generally taken as the rule for corporate behavior rather than the exception (Maitre-Ekern & Dalhammar, 2016; Satyro et al., 2018; Slade, 2009; Wrba & DiMatteo, 2018).

sell on the German and Japanese versus British and American markets because of different cultural robustness standards and tolerance (Maycroft, 2009). Prevalence of planned obsolescence is thus hard to assess because it varies for each product and because it requires an assessment of both designed product lifetimes and actual outcomes, the latter being highly dependent on consumer perceptions (themselves highly influenced by industry marketing).

In the narrow definition of 20th century Gross National Product, which excludes various costs (Raworth, 2017), planned obsolescence can be quite lucrative as an economic policy for a country or as a business strategy since it stimulates consumption therefore the economy. However, such policies also carry harmful financial-economic and ecological consequences. Financial-economic damage incurs when consumers overspend on prematurely inoperable products, losing out on time, energy, and intimacy with the products. Planned obsolescence is therefore labelled as a social waste of industrial policy (Packard, 1960), driven by short-term political and economic interests (Park, 2010).

With regard to the ecological consequences, planned obsolescence leads to inordinate waste and to the depletion of natural resources in production processes. Electronic waste (e-waste) arising from discarded electronics and electrical appliances, such as refrigerators, washing machines, TVs, mobile phones, tablets, and computers is one of the fastest growing categories of waste in both size and toxicity (Gao et al., 2019; Singh et al., 2019). When e-waste is carelessly disposed of or dismantled, the toxic substances it contains (e.g. lead, cadmium, chlorofluorocarbons) can contaminate nearby water, air and soil. This in turn pollutes ecosystems, crops and drinking water, causing damage to people and the environment. Resource wastefulness entails a loss of secondary raw materials since recycling practices are less successful in recovering valuable but minute (and often glued) components. Some of these natural resources are scarce (e.g. water, precious metals, etc.) and their extraction often involves human rights violations (Hilson, 2010). Toxicity is not the same for every product, and it is difficult to estimate the actual extent of the environmental harm, because it requires true cost accounting of each product's raw material extraction, transport, production and recycling. With true costs for the environment, human rights and the economy, the harms of planned obsolescence are diffuse and contested.

## Legal activities for corporate profit

The economic theory about planned obsolescence indicates that it can be an appealing business practice both in a market with a limited number of players or many competitors (Bulow, 1986). Regardless of the degree of concentration within a given market, business and business regulations are geared towards stimulating competition and innovation, but competition and innovation can also function as the driving force behind planned obsolescence (Guiltinan, 2009). Planned obsolescence is a competitive choice based on a corporate ecosystem requiring constant growth.

In the earliest infamous case, the *Phoebus* cartel artificially limited the lifespan of incandescent lamps. Light bulb producers had to send products to a lab in Switzerland on a regular basis to test their lifespan, and a system of fines was imposed to

guarantee that producers adhered to mutual predetermined obsolescence agreements. Although the cartel formally dissipated due to the arrival of new competitors and the start of the Second World War, it remains a striking example of how innovation and improvement of product quality was prevented on an industry-wide scale to increase product turn-over and thus profit. Although it is not evident that planned product aging or the design of such strategies in specific markets is always accompanied by cartel agreements—distortion of competition through price fixing or customer distribution—the *Phoebus* cartel nonetheless demonstrates that for effective implementation of planned aging in a certain market, ‘harmonization’ between competitors for a specific product group is required. Similar dynamics were at play in the European truck cartel which arranged mutual price agreements between the seven largest truck producers, effectively blocking the introduction of more energy-efficient technology (European Commission, 2016).

Established companies must often compete with innovative newcomers, so both are inclined to focus on rapid product development, because it provides competitive advantage. It can also be profitable for a company to focus on quality, granting longer lifespan for their products, in order to distinguish itself from competitors and thus not go along with the planned obsolescence; but such strategies remain the exception to the rule. An example of this exception in consumer electronics is the business plan of the ecologically- and socially-driven *Fairphone* constructed by modular replacement parts consumers can buy and install on their own (Wernink & Strahl, 2015).

Planned obsolescence is used as an instrument for competitive advantage and previous research in criminology has shown that competition can be criminogenic (Clinard & Yeager, 1980; Friedrichs, 2010; VanderBeken & Van Daele, 2008). Nevertheless, absence of effective competition, through cartel agreements or monopolies, can often be even more criminogenic vis-à-vis planned obsolescence, as the *Phoebus* cartel example demonstrates. The criterion that corporate crime goes hand in hand with legal business activities and benefits the company, applies to planned obsolescence. However, the picture is more complex since consumers and policy makers also play an important role. Planned obsolescence can be explained by an interplay of economic, political and social drivers with both governments and companies facilitating, committing or neutralizing this behaviour.

For many consumers, sustainability considerations are secondary when purchasing new products; price predominates consumer decisions (Guiltinan, 2009). Yet, market prices do not factor in true environmental costs, as these and other externalities are elusive, hard to identify and quantify and therefore perennially ignored in corporate strategy (Unerman et al., 2018). While corporate accounting increasingly reports on these externalities out of concern for business responsibilities (including in the United Nations’ Global Compact), we are far from a global consensus on incorporating externalities—the true costs—in product pricing.

Contributing to globalization’s unsustainable consumer patterns is how consumer markets teem with goods produced far from home, so that environmental damage and risks are far removed from the actual place of sale, removing the externalities of production from view (Ruggiero & South, 2013). Such damage is a routine consequence of social and economic patterns, regardless of whether they are criminalized (Shearing, 2015). Only through indirect subsidies for unsustainability is planned

obsolescence enabled as a viable business model. Wasteful production processes are regulated at a policy level through manipulating prices (e.g. taxing CO<sub>2</sub> emissions), thereby normalizing and accepting pollution and inefficiencies. Were these subsidized harms included in the price businesses had to actually pay, according to Tru-Cost accounting or carbon taxes, for example, many current business practices would no longer be profitable (Trucost & TEEB for Business Coalition, 2013).

### **(Non-)compliance in the socio-economic domain**

Our fourth criterium for corporate crime is non-compliance within the socio-economic domain. This refers to (often repeated) violations of environmental, labour, competition or fiscal law (Sutherland, 1983). As discussed above planned obsolescence strategies tread close to legal boundaries in environmental, competition, tax and consumer protection law, but these strategies often also fall within these legal boundaries, making the practice ‘lawful but awful’ (Passas and Goodwin, 2004). Relevant policies are in place for every phase of the product lifecycle, from product development to consumption to disposal; but the concept of planned obsolescence is seldom mentioned explicitly in these policies. Literature on corporate crime has drawn attention to the complexity of investigating and prosecuting violations (Wall-Parker, 2019). In the case of planned obsolescence, this complexity is extended to the design and implementation of various economic policies relevant for planned obsolescence. Such a designation is much broader than legally defining planned obsolescence as a crime because there are many alternative possibilities for regulation throughout the lifecycle of consumer electronics.

Waste legislation does not manage to eliminate discarded electrical and electronic products causing environmental and human harm. Governments worldwide have signalled their lack of power and control over e-waste and planned obsolescence through the absence of strong policies. Recycling rates vary significantly between regions, and policies on waste and waste trade also differ. Rather than regulating the operations of corporations, governments exhibit faith in corporations to take responsibility for the disposal of their products. In installing various versions of so-called ‘take back programs’, companies virtue signal both to the consumers and governments as environmentally responsible companies. Some recycling programs however involve relocating ‘resource-rich’ electronics from the global north to the global south for ‘de-manufacturing’ and re-use of the valuable components in manufacturing products for the global north, thereby once again externalizing the harm to human health and the environment (South, 2016, p. 20). From a more sceptical perspective, it is thus equally possible to say these actions constitute greenwashing with the real intentions of these companies concentrated on attracting additional customers and staving off mandatory regulations. If producers of electronics are committed to environmental sustainability, one could argue that it would make more sense to not make products designed to break down at premature programmed points. Greenwashing aims to defuse popular and governmental imposition of regulations and boycotts of corporate planned obsolescence operations. Recognizing that financial incentives exist for companies to promote CSR (Corporate Social Responsibility) programs, but not to



make their products last longer—since robust products create longer purchase cycles leading to less frequent revenue conversions—suggests the need for governmental disruptive regulation of companies, obligating them to engineer their products to be more robust and modular for repair.

Myriad methods of reducing e-waste earlier on in the product cycle exist, for example by promoting reuse and consumer right to repair. Through partnerships between producers and recycling companies, the EU promotes sustainable product development, so product design must not prevent reuse (cf. Circular Economy Action Plans mentioned above). The EU is also committed to reducing harmful substances in the production of electronics and electrical products. This falls under the Restriction of Hazardous Substances (RoHS) Directive, which, since 2006, phased out the use of certain toxic substances such as lead, mercury, hexavalent chromium, cadmium, polybrominated biphenyls and polybrominated diphenyl ethers with the intention of stimulating innovative product development. Similar legally binding product standards could be developed about other components or characteristics of consumer electronics.

In addition, a legal minimum lifespan of products could be introduced. A suitable method could be to nationally standardize the lifespan of a product and if a company's product does not last for the required amount of time, to issue a fine. No such governmental policy is currently in place, leaving it to individual companies to determine the lifespan of a product. While there are exceptions, such as companies like the home blender company *Vita-Mix* that do give standard 7-year warranties on their products, or *Tesla's* 8-year warranty on its electric battery, these companies must compete in a business environment that rewards planned obsolescence rather than product longevity.

Further, stricter standards could be developed, prompting organized dismantling of products to more easily recover and replace individual parts. This could be provided for by the producer as well as third parties who make parts. This is similar to the policy choices made by several European countries to strengthen product warranty under consumer protection laws, whereby repair could become the initial remedy rather than replacement (Wrbka & DiMatteo, 2018). The reuse of individual parts can also be looked into. This could be accompanied by consumer awareness campaigns and producer transparency about product characteristics. Think for instance of virtue signalling where repaired items could become a sign of dignity, and 'doing one's part' rather than as a sign of poverty and shame (Ingold, 2012).

However, asking companies to voluntarily bring new iterations of products onto the market less quickly is feasible only if all producers are willing to extend the life cycle of their products—if the playing field is levelled. For example, by using a different economic system in which the consumer is no longer 'owner' but 'user'. The producer remains the owner and therefore has an interest in producing products with a long-life cycle that are easy to reuse and repair. To this end, products can be equipped with a raw material passport (Rau & Oberhuber, 2016). This model requires design-for-disassembly instead of an end-of-life design strategy (Park,



2010). Another option is *Tesla*'s business model<sup>19</sup>, in which they explicitly consider the aging of certain components. Among other things, they provide for the return of batteries which they subsequently want to use for storing energy in houses. They use chips and hardware that can also handle future updates, which theoretically “makes obsolescence obsolete” (Hadhazi, 2016). As discussed above, *Tesla* has also faced class action lawsuits about planned obsolescence.

Social developments also combat planned obsolescence. Launched in 2012, the London based company *The Restart Project* hosts regular ‘Restart Parties’ where volunteers repair broken items free of charge. So far, the company has prevented 22,633 kg of electronic waste from being sent to landfill (*The Restart Project—The Right to Repair and Reuse Your Electronics*, <https://therestartproject.org/about/>). Similar initiatives occur on a global level in so-called repair or recovery cafés in different cities in Europe and North America resulting in products being repaired, so that material obsolescence is at least postponed. Indeed, “the most preferred option would be prevention (due to durable products), followed by boosting reparability and upgradability, with a further suggestion to promote trade-in options in order to influence recycling” (Malinauskaite & Erdem, 2021, p. 31). The lifecycle impact of a product is contingent on how long its functionality lasts, in addition to the resources it takes to make it. In recent years, the “right to repair” movement has increased public attention to these issues, finding reuses for electronic components through repair as well as promoting using more reused and recycled materials to make the products less resource intensive. The longevity of e-products, however, has lagged as a central societal and corporate concern. This discrepancy can be partially explained by the cross incentives of corporations wishing to perform sustainability to meet CSR expectations and public demands, while not disrupting a working recipe driving a bottom line relying on ever-increasing annual sales. This suggests governments must relocate incentives for innovation away from incremental features on existing technologies, and towards solving global wicked problems, like the zombie afterlife of electronics (Luther, 2010).

Tax incentives are another mechanism to mitigate the fatal attraction of planned obsolescence. In an attempt to stimulate the remanufacturing market, Sweden reduced their tax rate (VAT) for repair work to bicycles, clothes and shoes in 2017 from the standard 25–12% to incentivize goods to be repaired rather than for people to buy new items (Malinauskaite & Erdem, 2021). Sweden also provides tax breaks on labour for repairs of smart phones, computers and other electronics, incentivizing longer use of planned obsolescence products. The Swedish government’s official reasoning for these measures is not to reduce e-waste or planned obsolescence per se, although these are positive side-effects of the tax law. Instead, the law incentivizes consumers to repair broken devices rather than buying new ones to keep money circulating in local economies rather than haemorrhaging currency to other countries from which new electronics hail. Other countries might find it harder to install similar policies. Take the example of Ireland, which hosts *Apple*’s headquarters which is the

<sup>19</sup> Recently concerns were raised by consumers about the durability of others parts and the willingness of *Tesla* to replace them without cost to consumers. Lawsuits are currently pending in the Netherlands. <https://radar.avrotros.nl/uitzendingen/gemist/item/klachtenafhandeling-tesla-bij-mankementen-schiet-tekort/>.

country's biggest private employer. A country's economic dependence on planned obsolescence financed companies comes with a downside—any attempt to regulate company operations is met with resistance and sometimes threats of relocating operations.

Rebalancing tax incentives are one policy tool governments can use to change both corporate and consumer behaviour to favour product longevity and disfavour unnecessarily premature disposal and breakage. When infrastructure and incentives exist to easily and inexpensively repair items, consumers are likely to opt for these in a competitive market (Olivola & Sussman, 2015), and green marketing is likely to play up these virtues for consumers (Govender & Govender, 2016). For the 2020 (postponed to 2021) Japan Olympics and Paralympics, Olympic medals were made from gold rescued and reprocessed from discarded phones, showcasing how waste can be reframed and reused (Villas-Boas, 2019). Thus, the role of institutional leadership—both normatively and legally—is crucial to even the playing field for manufacturers committed to taking an environmentally responsible path of product longevity.

Companies often blame weak regulations for creating an uncompetitive environment disincentivizing doing the right thing environmentally and socially; often rightfully so. For example, in 2020 the US Food and Drug Administration (FDA) ruled that electronic cigarettes (e-cigarettes) could not be sold in flavours other than tobacco and menthol. However, they included an exception for single-use disposable products (Bernabe et al., 2020). While in the US the manufacturer *Juul* previously held roughly 70% of domestic e-cigarette market share, other upstart e-cigarette companies such as *Cool Cloud's Puff Bar* started creating single-use heavily flavoured disposable e-cigarettes to take advantage of the interim loophole in the law. Accessing flavours such as *Tangerine Ice* and *Blue Razz*, and no longer able to get flavours for their previously favoured devices, youth rapidly shifted their vaping brands from reusable *Juul* to disposable *Puff Bar* (Dai & Hao, 2020). In this case, the planned obsolescence of a device—about 20 cigarettes worth of nicotine and then the entire lithium ion battery is trashed along with the rest of the circuitry and plastic of the device—came about through government ineptitude. By creating a loophole that created a business opportunity for disposable rather than reusable products, the US FDA actually encouraged youth and others drawn to consumption of flavoured products to their most environmentally toxic form—unrecyclable, non-reusable e-cigarette devices (Bernabe et al., 2020).

Governments have responsibilities to reduce incentives for planned obsolescence through implementing extended producer responsibility measures that require manufacturers to be responsible for the entire lifecycle of a product—therefore costing the company to dispose or reuse spent products (Maitre-Ekern, 2021). Such laws rationalize product lifecycles and business strategies with consumer and environmental rights. As these costs are otherwise born by society and the environment, such regulations actually only internalize existing externalities. Trucost accounting, which the United Nations Environmental Program has developed and funded to calculate the entire social costs of products (including methane emissions for cattle, or public health care costs for smoking) provides a mechanism to accurately assess the real rather than artificially subsidized costs of products in their total effect on society. Without reducing the culpability of corporations for the ecological harm they cause

through taking advantage of lax, inefficient, or poorly written and conceived regulations, the role that governments play in setting up rational rules that corporations must then respond to, should not be underestimated.

## Conclusions

Planned obsolescence is a core business strategy in today's economy—adopted by various sectors besides electronic goods manufacturers. This strategy artificially limits the usable life of products to bolster private profit at the expense of consumer interests and environmental sustainability, leaving the product prematurely obsolete and, more often than not, discarded resulting in a growing pile of waste (Wrbka & DiMatteo, 2018). Planned obsolescence is increasingly recognized by policy makers as an unsustainable business practice, but has been overlooked, both academically and legally, as a corporate environmental crime. In this article, we have argued that planned obsolescence—whether through hardware, software or difficult repairs—can be considered a form of corporate crime. All four characteristics of corporate crime apply to planned obsolescence, namely (1) conceptual ambiguity and moral ambivalence, (2) (material) damage but the victims and scale are difficult to determine, (3) relation to legal professional practice and business activities, and (4) offenses take place within the socio-economic domain.

By positioning planned obsolescence as a form of corporate crime (in the criminological conceptualisation), questions on the role of governments and corporations, as well the role of consumers, can be formulated and framed to expedite legal progress on the multifaceted issue of planned obsolescence and its almost century-old legacy of industrial production. This prompts questions around the effect of organising markets with a focus on zero-sum competition and innovation, as well as the systemic drivers of the environmental and waste issues surrounding this topic (Mazzucato, 2018). Business strategies do not operate in a vacuum, but instead emerge from the prevailing economic system and regulatory environment in which they operate. This environment is strongly influenced by the “human-exemptionalist paradigm” (Foster & Holleman, 2012, p. 1626), which flaunts physical, chemical, biological, and social laws and their sciences by viewing every evident externality as neutralizable by future innovation. Basing justice and even survivability on future innovation raises issues of intergenerational and environmental justice as well. The prevalence of planned obsolescence in electronic device production is rife and shows scant potential for *sui generis* reduction. Ecological design suggests that rather than planned obsolescence, ecological engineering coupled with regulations that support sustainability must focus on quantifying and instituting methods of achieving robustness, repairability, reusability and accounting for and internalizing externalities. It is possible, with robustness standards based in ecological engineering rather than planned obsolescence based on sales turnover, to achieve a material throughput reduction while maintaining product utility and profit (De Angelis, 2017).

By highlighting planned obsolescence's core cases and concerns, we encourage criminologists and other scholars to investigate these business strategies not only per their unsustainability, but also their criminological relevance. (E-)Waste crime has

long been established as a noteworthy topic, but planned obsolescence as the business strategy enabling excessive waste generation has not. By focusing on planned obsolescence, legal interventions and policy harmonization can take a public health approach of prevention to corporate environmental crime.

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## References

- Adamson, G. (2003). *Industrial strength design how brooks stevens shaped your world*. MIT Press.
- Aladeojebi, T. (2013). Planned obsolescence. *International Journal of Scientific & Engineering Research*, 4(6), 1504–1508.
- Amandam, & Medium (2020). *6 times printer companies tried to screw people over and the five times people won*. [https://medium.com/@amandam\\_95165/6-times-printer-companies-tried-to-screw-people-over-dbc0e1eb5149](https://medium.com/@amandam_95165/6-times-printer-companies-tried-to-screw-people-over-dbc0e1eb5149)
- Apple Support. (n.d.). *About genuine iPhone batteries*. Retrieved August 24 (2020). from <https://support.apple.com/en-us/HT210323>
- Bacher, J., Dams, Y., Duhoux, T., Deng, Y., Teittinen, T., & Mortensen, L. (2020). *Electronic products and obsolescence in a circular economy*.
- Bakker, C., Wang, F., Huisman, J., & den Hollander, M. (2014). Products that go round: Exploring product life extension through design. *Journal of Cleaner Production*, 69, 10–16. <https://doi.org/10.1016/j.jclepro.2014.01.028>
- Barak, G. (2015). *The Routledge international handbook of the crimes of the powerful*. Routledge.
- Bernabe, E., Wagschal, G., & Weil, R. (2020). *Loophole in vaping ban has teens turning to disposable e-cigarettes*. ABC News.
- Bisschop, L. (2012). Is it all going to waste? Illegal transports of e-waste in a European trade hub. *Crime, Law and Social Change*, 58(3), 221–249.

- Bisschop, L. (2013). Go with the e-waste flows. The governance reality of illegal transports of e-waste in a European trade hub. In van P. Duyne, J. Harvey, G. Antonopoulos, von K. Lampe, A. Maljević, & J. Spencer (Eds.), *Human dimensions in organised crime, money laundering and corruption* (pp. 393–424). Wolf Legal Publishers.
- Blanken, I. J. (1999). *The history of philips electronics NV: The development of NV philips' Gloeilampen-fabrieken into a major electrical group*. European Library.
- Bonger, W. A. (1916). *Criminality and economic conditions*. Boston: Little, Brown.
- Brisman, A., & South, N. (2013). Conclusion: The planned obsolescence of planet earth? How green criminology can help us learn from experience and contribute to our future. In N. South, & A. Brisman (Eds.), *Routledge handbook of green criminology* (pp. 409–417). Routledge.
- Bulow, J. (1986). An economic theory of planned obsolescence. *The Quarterly Journal of Economics*, 729–750.
- Cissé, S., Metcalf, C., de Meersman, G. (2020). In the crosshairs: Planned obsolescence, linklaters. <https://www.linklaters.com/en/insights/blogs/digilinks/2020/march/in-the-crosshairs---planned-obsolescence>
- Chen, X. (2013). *Planned obsolescence and the quality choice of durable goods*. Tulane University.
- Clinard, M., & Yeager, P. (1980). *Corporate crime*. Free Press.
- Connolly, N. (2016). Exteme couponing: Reforming the method of calculating attorneys' fees in class action coupon settlements. *Iowa L. Rev*, 102, 1335.
- Cooper, T. (2004). Inadequate life? Evidence of consumer attitudes to product obsolescence. *Journal of Consumer Policy*, 27(4), 421–449.
- Cooper, T. (2016). *Longer lasting products: Alternatives to the throwaway society*. Routledge Taylor and Francis Group.
- Dai, H., & Hao, J. (2020). Online popularity of JUUL and Puff Bars in the USA: 2019–2020. *Tobacco Control*.
- Dannoritzer, C. (2010). *The light bulb conspiracy*. Documentary Available at: <http://Dotsub.Com/View/Aed3b8b2-1889-4df5-Ae63-Ad85f5572f27>
- De Angelis, D. M. (2017). *Omnia sunt communia: On the commons and the transformation to postcapitalism*. Zed Books Ltd..
- Epson (2020). (n.d.). *Error message*. Retrieved August 28, from <https://www.epson.ee/viewcon/corporatesite/kb/index/1582>
- Euroconsumers (2021). Euroconsumers files €60 million class action lawsuit against Apple in Italy. Press release. [https://assets.ctfassets.net/iapmw8ie3ije/4zMgaeXbZ5sZEqwiSNyVck/dea9914bb631761645b034b120ec7f9f/Euroconsumers\\_Class\\_Action\\_Apple\\_-\\_Italy\\_.pdf](https://assets.ctfassets.net/iapmw8ie3ije/4zMgaeXbZ5sZEqwiSNyVck/dea9914bb631761645b034b120ec7f9f/Euroconsumers_Class_Action_Apple_-_Italy_.pdf) [last consulted 17 February 2022].
- European Commission (2016). *Statement by Commissioner Vestager on decision to fine truck producers €2.93 billion for participating in a cartel*. [https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT\\_16\\_2585](https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_16_2585)
- Foster, J. B., & Holleman, H. (2012). Weber and the environment: Classical foundations for a postexemptionalist sociology. *American Journal of Sociology*, 117(6), 1625–1673.
- Friedrichs, D. (2009). *Trusted criminals: White collar crime in contemporary society*. Cengage Learning.
- Friedrichs, D. (2010). Integrated theories of white-collar crime. In F. Cullen, & P. Wilcox (Eds.), *Encyclopedia of criminological theory* (pp. 480–487). Sage Publications. <https://doi.org/10.4135/9781412959193>
- Friedrichs, D. (2019). White collar crime: Definitional debates and the case for a typological approach. *The Handbook of White-Collar Crime*, 16–31.
- Gallagher, M. I. I. (2015). The coupon quandry: Restructuring incentives in CAFA coupon settlements. *Notre Dame Law Review*, 91, 2091.
- Gao, Y., Ge, L., Shi, S., Sun, Y., Liu, M., Wang, B. & Tian, J. (2019). Global trends and future prospects of e-waste research: A bibliometric analysis. *Environmental Science and Pollution Research*, 26(17), 17809–17820.
- Geis, G. (1987). White collar crime: The heavy electrical equipment antitrust cases of 1961. In M. Ermann, & R. Lundmann (Eds.), *Corporate and governmental deviance: Problems of organizational behavior in contemporary society* (pp. 111–130). Oxford University Press.
- Gibbs (2018). Apple and Samsung fined for deliberately slowing down phones. *The Guardian*.
- Gibbs, C., McGarrell, E., & Axelrod, M. (2010). Transnational white-collar crime and risk. Lessons from the global trade in electronic waste. *Criminology & Public Policy*, 9(3), 543–560.
- Gibbs, C., & Simpson, S. S. (2009). Measuring corporate environmental crime rates: Progress and problems. *Crime, Law and Social Change*, 51(1), 87–107.

- Govender, J. P., & Govender, T. L. (2016). The influence of green marketing on consumer purchase behavior. *Environmental Economics*, 7, 77–85.
- Gregory, P. M. (1947). A theory of purposeful obsolescence. *Southern Economic Journal*, 24–45.
- Guiltinan, J. (2009). Creative destruction and destructive creations: Environmental ethics and planned obsolescence. *Journal of Business Ethics*, 89(1), 19–28. <https://doi.org/10.1007/s10551-008-9907-9>
- Hadhazi, A. (2016, June 12). Here's the truth about the planned obsolescence of tech. *BBC Future*.
- Hillyard, P., Pantazis, C., Tombs, S., & Gordon, D. (2004). *Beyond criminology: Taking harm seriously* (p. 332). Fernwood Publishing.
- Hilson, G. (2010). Child labour in african artisanal mining communities: Experiences from northern ghana. *Development and Change*, 41(3), 445–473. <https://doi.org/10.1111/j.1467-7660.2010.01646.x>
- Iizuka, T. (2007). An empirical analysis of planned obsolescence. *Journal of Economics & Management Strategy*, 16(1), 191–226.
- Ingold, T. (2012). Toward an ecology of materials. *Annual Review of Anthropology*, 41(1), 427–442. <https://doi.org/10.1146/annurev-anthro-081309-145920>
- Jaspers, J.D., & Bisschop, L.C.J. (2017). Planned obsolescence als organisatiecriminaliteit. In R.H.J.M. Staring, R. van Swaeningen, & K. van Wingerde (Eds.), *Over de muren van stilzwijgen: Liber amicorum Henk van de Bunt* (pp. 561–574). Boom Criminologie.
- Koolhoven, R., & Heerema, L. (2018). Fighting planned obsolescence or 'the lightbulb conspiracy' as an unfair commercial practice: For a circular economy. In M. M. Carvalho (Ed.), *Law & Technology: E.Tec Yearbook* (pp. 27–56). (E.Tec Yearbook). JusGov, Research Centre for Justice and Governance. [http://issuu.com/comunicadireito/docs/e\\_tek\\_yearbook\\_web](http://issuu.com/comunicadireito/docs/e_tek_yearbook_web)
- Lambert, F. (2021). Tesla agrees to pay owners \$625 each over battery throttling after class-action lawsuit, *electrek*, 30 July 2021. <https://electrek.co/2021/07/30/tesla-agrees-pay-owners-battery-throttling-class-action-lawsuit/>
- La Rosa, E. (2020). Planned obsolescence and criminal law: A problematic relationship? *Sustainability and Law* (pp. 221–236). Springer.
- Lipton, A. (2021). Economic and planned obstacles to SDG 12. *Medium*. <https://medium.com/una-nca-snapshots/economic-and-planned-obstacles-to-sdg-12-a389607bbef>
- London, B. (1932). *Ending the depression through planned obsolescence*. New York.
- Luther, L. (2010). *Managing electronic waste: Issues with exporting E-waste*. Congressional Research Service.
- Lynch, M., Long, M., Stretesky, P., & Barrett, K. (2019). Measuring the ecological impact of the wealthy: Excessive consumption, ecological disorganization, green crime, and justice. *Social Currents*, 6(4), 377–395.
- Lynch, M., Stretesky, P., & Long, M. (2016). *Defining crime: A critique of the concept and its implication*. Springer.
- Maitre-Ekern, E. (2021). Re-thinking producer responsibility for a sustainable circular economy from extended producer responsibility to pre-market producer responsibility. *Journal of Cleaner Production*, 286, 125454.
- Maitre-Ekern, E., & Dalhammar, C. (2016). Regulating planned obsolescence: A review of legal approaches to increase product durability and reparability in Europe. *Review of European, Comparative & International Environmental Law*, 25(3), 378–394.
- Malinauskaite, J., & Erdem, F. B. (2021). *Planned obsolescence in the context of a holistic legal sphere and the circular economy*. Oxford Journal of Legal Studies.
- Maycroft, N. (2004). The objectness of everyday life: Disburdenment or engagement? *Geoforum*, 35(6), 713–725.
- Maycroft, N. (2009). *Consumption, planned obsolescence and waste*.
- Mazzucato, M. (2018). *The entrepreneurial state: Debunking public vs. private sector myths*. Penguin Books.
- Metze, M. (2012). *Anton Philips 1874-1951*. Uitgeverij Balans.
- News, B. (2019, November 21). Apple "loses money on phone repairs."
- OECD. (1982). *Product durability and product-life extension*. Organisation for Economic Co-operation and Development.
- Ofcom (2020). *Mobile phone locking and unlocking*. <https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/advice/mobile-phone-locking-and-unlocking>
- Olivola, C. Y., & Sussman, A. B. (2015). *Taxes and consumer behavior*.
- Packard, V. (1960). *The waste makers* (Vol. 1064). Penguin London.



- Park, M. (2010). E-waste and obsolescence: Designing out toxicity. *Design Research Society 2012 Bangkok*, 825–834.
- Passas, N. (2005). Lawful but awful: 'Legal corporate crimes.'. *The Journal of Socio-Economics*, 34(6), 771–786.
- Passas, N., & Goodwin, N. (2004). *It's legal but it ain't right: Harmful social consequences of legal industries*. University of Michigan Press.
- Pope, K. (2017). *Understanding planned obsolescence: Unsustainability through production, consumption and waste generation*. Kogan Page Publishers.
- Prakash, S., Dehoust, G., Gsell, M., Schleicher, T., & Stamminger, R. (2016). Einfluss der Nutzungsdauer auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen "Obsoleszenz." Dessau, Germany: Umweltbundesamt.
- Rau, T., & Oberhuber, S. (2016). *Material Matters. Het alternatief voor onze roofofbouwmaatschappij*. Bertram + de Leeuw.
- Raworth, K. (2017). *Doughnut economics: Seven ways to think like a 21st-century economist*. Chelsea Green Publishing.
- Remy, N., Speelman, E., & Swartz, S. (2016). *Style that's sustainable: A new fast-fashion formula*. McKinsey. <https://www.mckinsey.com/business-functions/sustainability/our-insights/style-thats-sustainable-a-new-fast-fashion-formula>
- Ruggiero, V., & South, N. (2013). Green criminology and crimes of the economy: Theory, research and praxis. *Critical Criminology*, 21, 359–373.
- Šajin, N. (2021). *Legislative train schedule*. European Parliament. Retrieved July 21, 2021, from <https://www.europarl.europa.eu/legislative-train>
- Shearing, C. (2015). Criminology and the anthropocene. *Criminology and Criminal Justice*, 15(3), 255–269.
- Sherif, Y. S., & Rice, E. L. (1986). The search for quality: The case of planned obsolescence. *Microelectronics Reliability*, 26(1), 75–85. [https://doi.org/10.1016/0026-2714\(86\)90776-6](https://doi.org/10.1016/0026-2714(86)90776-6)
- Simpson, S. S. (2019). Reimagining Sutherland 80 years after white-collar crime. *Criminology*, 57(2), 189–207.
- Singh, N., Duan, H., Ogunseitan, O. A., Li, J., & Tang, Y. (2019). Toxicity trends in E-Waste: A comparative analysis of metals in discarded mobile phones. *Journal of Hazardous Materials*, 380, 120898.
- Smith, O., & Brisman, A. (2021). Plastic waste and the environmental crisis industry. *Critical Criminology*, 29, 289–309. <https://doi.org/10.1007/s10612-021-09562-4>
- Solomon, R., Sandborn, P. A., & Pecht, M. G. (2000). Electronic part life cycle concepts and obsolescence forecasting. *IEEE Transactions on Components and Packaging Technologies*, 23(4), 707–717.
- South, N. (2016). Green criminology and brown crime: Despoliation, disposal and de-manufacturing in global resource industries. In T. Wyatt, T. (Ed.), *Hazardous waste and pollution*. Springer.
- Suovanen, J. (2019). *iPhone 11 Battery Replacement*. iFixit. <https://www.ifixit.com/Guide/iPhone+11+Battery+Replacement/127450>
- Sutherland, E. (1945). Is "white collar crime" crime? *American Sociological Review*, 10(2), 132–139.
- Sutherland, E. (1983). *White collar crime: The uncut version*. Yale University Press.
- Tappan, P. (1947). Who is the criminal. *American Sociological Review*, 12, 96–102.
- Taylor, I., Bonger, W., & Turk, A. T. (1971). *Criminality and economic conditions*. Little, Brown and Company.
- Tombs, S., & Whyte, D. (2009). Crime, harm and corporate power. *Crime: Local and Global*, 137–172.
- Trucost, P. L. C., & TEEB for Business Coalition. (2013). *Natural capital at risk: The top 100 externalities of business*.
- Unerman, J., Bebbington, J., & O'dwyer, B. (2018). Corporate reporting and accounting for externalities. *Accounting and Business Research*, 48(5), 497–522.
- Vallauri, U. (2012). *Triumphing together against planned obsolescence*. The Restart Project. <https://therestartproject.org/design/triumphing-together-against-planned-obsolescence/>
- van de Bunt, H. (1992). *Organisatiecriminaliteit*. Gouda Quint.
- Van de Bunt, H., & Huisman, W. (1999). Het kan ook anders: Overwegingen bij de keuze tussen klassiek of alternatief reguleren op milieuteren. *Justitiële Verkenningen*, 28(2), 29–43.
- Van de Bunt, H., & Huisman, W. (2004). Organisatiecriminaliteit. *Tijdschrift Voor Criminologie*, 46(2), 106–120.
- van Wingerde, K. (2015). The limits of environmental regulation in a globalized economy. *The Routledge Handbook of White-Collar and Corporate Crime in Europe*, 260.



- VanderBeken, T., & Van Daele, S. (2008). Legitimate business and crime vulnerabilities. *International Journal of Social Economics*, 35(10), 739–750.
- Vasseur, L. (2020). *Obsolescence des iPhone: Une sanction historique contre Apple*. <https://www.halteobsolescence.org/apple-condamne-suite-a-la-plainte-deposee-par-hop/>
- Villas-Boas, A. (2019). Japan recycled nearly 80,000 tons of cell phones and other electronics to make the medals for the 2020 Tokyo Olympics and Paralympics. *Business Insider*.
- Wall-Parker, A. (2019). Measuring white collar crime. *The Handbook of White-Collar Crime*, 32–44.
- Wernink, T., & Strahl, C. (2015). Fairphone: Sustainability from the inside-out and outside-in. *Sustainable value chain management* (pp. 123–139). Springer.
- White, J. (2017). *Apple sued over slowing phones in France, where planned obsolescence is a crime*. Independent. <https://www.independent.co.uk/life-style/gadgets-and-tech/apple-lawsuit-phones-slow-france-planned-obsolescence-legal-challenge-crime-a8132371.html>
- Whitehead Lorh, S. (2014). *5 Truths the fast fashion industry doesn't want you to know*. Huffington Post. [https://www.huffpost.com/entry/5-truths-the-fast-fashion\\_b\\_5690575](https://www.huffpost.com/entry/5-truths-the-fast-fashion_b_5690575)
- Wong, C. (2012). *Planned obsolescence: Competition against longevity*. ESSA. [http://economicstudents.com/2012/09/planned-obsolescence-competition-against-longevity/#\\_edn1](http://economicstudents.com/2012/09/planned-obsolescence-competition-against-longevity/#_edn1) Melbourne.
- Wrba, S., & DiMatteo, L. A. (2018). Comparative warranty law: Case of planned obsolescence. *University of Pennsylvania Journal of Business Law*, 21, 907.

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