Another perspective on environmental impacts of planned obsolescence

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Abstract[1]
Faced with the limitations set by our planet (raw materials, energy etc.), with climate change and with the need to keep down waste emissions of all kinds, our societies are necessarily going to have to effect a major transition – the so-called "ecological transition". With this stake in mind, and with a more sustainable model of production and consumption as the goal, the fight against the so-called "built-in" obsolescence of products has a major part to play. And yet, are we able to assess the real ecological impact of the products concerned, from the point of manufacture to the end of their life?

We have studied this question considering many studies about lifetime of products at the French Environment and Energy Management Agency (ADEME), provide some valuable data to an answer. We begin by reminding what is meant by "built-in obsolescence" (showing the pertinence and limits of the concept). Drawing on many life-cycle analyses, we then examine the ecological impact of the goods (domestic appliances, cars, computers and smartphones) and the underlying causes of the phenomenon (innovation, new technologies, fashion …).

We propose a variety of avenues and strategies whereby that impact can be reduced, depending on whether it is caused mainly by the use of the item (70 to 80 % of energy consumption in use for car) or its manufacture (90 to 99 % for some smartphone impacts). What is ultimately, important is to make both manufacturers and consumers act responsibly (differently depending on where the impacts are), the former by encouraging a move towards the "circular" or "functional" economy and the latter by providing them with better information on the lifespan and ad hoc incentives.

Introduction
In our consumer society, struggle against planned obsolescence is like the mythical chimera. Everybody talks about it, nobody really knows where it lives. Planned obsolescence itself is something of a myth, and like all respectable myths, it must have its origins in a founding element. In this case, the Phoebus cartel of 1924 is often cited as the starting point of planned obsolescence in industrial society. Arguments against planned obsolescence often begin with this collusion that was declared illegal by the authorities a few years later, not for reasons of product quality, but for price fixing. For more than a century, since the advent of mass production, this issue has occupied economists, sociologists, engineers and theoreticians who study consumer society. From Thorstein Veblen, who identified some of the determining features of consumer society over a century ago (Veblen, 1899), with Lewis Mumford who questioned "product durability" in the 1930s and Bernard London who was probably the first to use the term "planned obsolescence" (London, 1932), and Serge Latouche who recently explored the earliest origins of this society (Latouche, 2012).

Consumers today widely accept one notion: they would feel "cheated" if manufacturers offered products with an ever shorter life span. For their part, manufacturers regularly claim that

1. This paper is a revised translation of the following article: Vidalenc E. et Meunier L. 2014, *Obsolescence des produits: l'enjeu écologique,* Futuribles, n. 402.

the life expectancy of products is generally unchanged, on the basis of their studies conducted since the 1960s.

It is easy to find examples to play the devil's advocate, for both sides of the debate. For one, a manufacturer of smartphone and its welded-in batteries that are very hard to replace, or a manufacturer of TV set and its flat screen condensers that are placed so that they will inevitably overheat; on the other hand, there are a number of categories of consumer goods (cook stoves, kitchen hoods, freezers) for which the average useful life has increased over the last decade … This illustrates how badly we need to use a meaningful definition of planned obsolescence.

While innovation has always led to the replacement of "old-fashioned" and out-dated technical objects, the recent accelerated pace of renewal, of high-tech products in particular, is on an entirely different scale. And we should not forget the accumulation of goods that is the result of new products: mobile phones, smartphones appeared under 10 years ago, digital tablets that were unknown to home consumers just a few years ago. Rather than opening a broad discussion on innovation, here we want to address the pace of product renewal, and the environmental consequences thereof.

First we will look at the controversies surrounding planned obsolescence. Secondly we will see how product life expectancy is a central factor for reducing the impact of a number of types of durable goods, and also how this is far from being true for all types of goods. In conclusion, we propose, on the basis of this analysis, a few general operative principles that go beyond simple injunctions to extend or curtail the useful life of products.

What is Planned obsolescence?

As the notion of planned obsolescence is far from consensual among economists, it is interesting to take a closer look at the main types of obsolescence: technical, regulatory, economic, and psychological obsolescence. The steering committee of a study led by ADEME of product life span divided obsolescence into two categories (BIO-IS, 2012):

- Functional obsolescence: a product no longer fulfils new use expectations, for technical, regulatory and/or economic reasons.
- Evolutionary obsolescence: a product no longer corresponds to users' desires, for reasons of design, style, fashion, etc.

Presumably neither of these is "planned". But both have an impact on product lifespan. Taking the data generally used for life cycle assessment (LCA) studies, product lifespan can range from a few months for some electronic gadgets, to 10 years for vacuum cleaners and television sets, and over 15 years for automobiles. Furthermore, the trends for lifespans are quite diverse. The life expectancy of vehicles is rising, while that of smartphones (which was admittedly extremely short) is stabilizing, and that of white goods is diminishing very slightly. It is thus difficult to deduce an overall dynamic from trends that are so dissimilar.

Various organizations have carried out studies, from Friends of the Earth-France to the GIFAM manufacturers' group, and each finds trends that shore up the organization's own position. GIFAM finds that the useful life of refrigerators has barely changed from the 1970s (SOFRES, 1979) to today (TNS-SOFRES, 2011), from 11 years and 5 months to 10 years and 7 months. Friend of the Earth-France group has less positive findings, and estimates that the average life expectancy of common household appliances is between 6 and 8–9 years today, compared to 10 to 12 years previously (Amis de la Terre and CNID, 2010).

With its study of electrical and electronic equipment (EEE), ADEME furnishes contrasting perspectives, depending on the type of appliance. It remains that the "life span" of a product is in fact not well known, and is in general taken to be the same as the time of ownership by a given household. Actors in various product chains have observed the absence of a "common language" pertaining to the notion of "life span". The regularly observed confusion between duration of use and duration of ownership would not necessarily be problematic if uses were stable, but this is rarely the case. For instance, the number of washing machine cycles per week is rising. In any case life span is almost never determined by "time during which the appliance is on" or the "number of cycles"; except for light bulbs for which a minimal rated service life is given in number of hours, ranging from 1,000 to 30,000 hours depending on the lamp. In other cases, e.g. benchmarks and reference data used for environmental information display, frequency of use is taken into consideration, in addition to duration of ownership (4 hours/day for television sets, 5.5 hours/month for mobile phones, multiplied by years of ownership).

In short, there is no standard methodology for measuring the useful life (service life) of products. The fact that estimated life spans are not readily comparable and the low visibility for consumers are illustrations of the difficulties encountered when discussing this topic.

To get a more complex understanding of the concept of obsolescence, we can use a study led by DEFRA (Brook Lyndhurst, 2010) that described the relationships that consumers have with the products:

- Up to date: products that are commonly replaced in response to a desire for change, e.g. clothes, mobile phones, television sets, among others. To illustrate, what smartphone user (over 18 million units sold in 2014 in France) would be content with a plain old mobile phone (roughly 6 million sold) like those marketed in the early 2000s?
- Investment: products for which the consumer is willing to pay more than just the strict minimum, for reasons of functionality, or aesthetics; top-of-the-range clothing, furniture, audio and video systems.
- Workhorse: productions that are used out of necessity, and generally until they give out; home appliances, lawn mowers, etc.

In a nutshell, planned obsolescence is a contested concept. In the next part we will see why it is probably un-relevant to define levers and means to reduce environmental impacts, particularly because extended life span is not always a good way to reduce environmental impacts of goods.

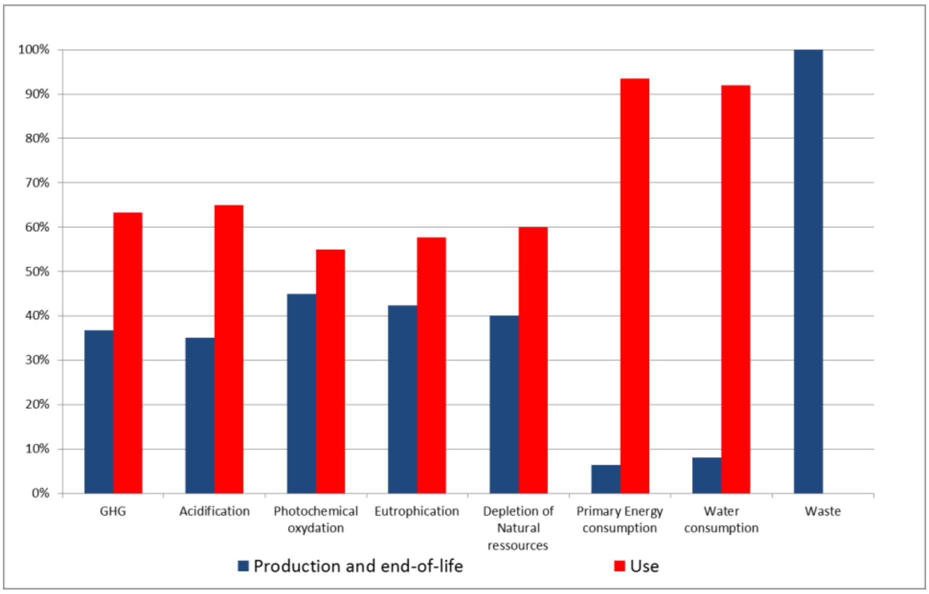

Figure 1. Share of impacts of Refrigerator in a Life Cycle Analysis.

Are longer-life goods better for the environment?

METHODOLOGICAL APPROACH

To answer to the crucial question of increasing the lifespan of consuming goods to reduce environmental impacts, we chose to use Life Cycle Analysis (LCA), and particularly, to analyse the results of a large study led by ADEME about consumption and levers to reduce environmental impacts of French consumption (BIO-IS, 2011).

When discussing sustainability the notion of reversibility is central. What is the status of reversibility for goods that have a life span of several decades? If cars are in service for 30 years, to reduce energy consumption in transport levers other than technical progress on drive trains, vehicle size and energy vectors will have to be considered. In short, with very long vehicle life we would be deprived of the "numerous" innovations that new vehicles could introduce. But this blissfully technophilic reasoning does not hold for all types of products, as we will see by looking at life cycle assessments (LCA) for various products. General recommendations regarding product life and use can be drawn from some examples of common consumer goods. What goods should be replaced? Which should have an extended life? How can this be achieved?

The relevance of Life Cycle Analysis

The potential quantifiable environmental impacts of goods and services, from the extraction of materials used in manufacturing or in agricultural production, to end-of-life treatment and disposal, can be estimated using the standardized life cycle assessment method (ISO 14040 and ISO 14044).

This method draws up an exhaustive balance sheet covering natural resources and energy consumed, and environmental discharges (air, water and soil pollution, waste) for all the processes involved in producing in a consumer item or service. Goods and services are classed by function.

The first step is to establish an inventory of consumption and discharges for each stage in the system. The flows of material and energy extracted from and discharged to the environment at each stage are then aggregated to establish values for environmental impact indicators.

Using the LCA method, products and services that fulfil the same function can be compared. The shifting of pollution from one environmental compartment to another, or from one stage of the life cycle to another, can be highlighted in comparing two situations. LCA is a multi-criteria approach that uses temporal and territorial scales, and not fixed in advance, that are relevant for the object under study.

GOODS FOR WHICH 80 % OF IMPACT IS DETERMINED BY USE

Electrical home appliances (white goods)

The multi-impacts method (LCA) shows that the use phase can be a determining factor for the impact of home appliances. This is true regardless of the impact considered, with the exception of waste. Regarding energy use for a refrigerator, and considering that energy is a good proxy for overall impact, the use phase is even more decisive: 10 times more impact in use than in the "production and end of life" phases.

The LCA graphs given here are not subject to interpretation in the same manner. For our purposes it is above all important to determine the "weight" of the use phase compared to other phases – production, manufacturing, components, and end-of-life – that may be presented differently, depending on the type of product. When the use phase is preponderant in the final balance sheet it may be a good idea to "renew" the product and replace it with a more efficient or advanced product.

Expressed simply, almost in caricature, if a new technology represents more than 10 % savings in annual energy use for this kind of product (most notably refrigerators) it is advantageous to renew the product after just one year of use – if the new product is kept for 10 years. To temper this technophilic

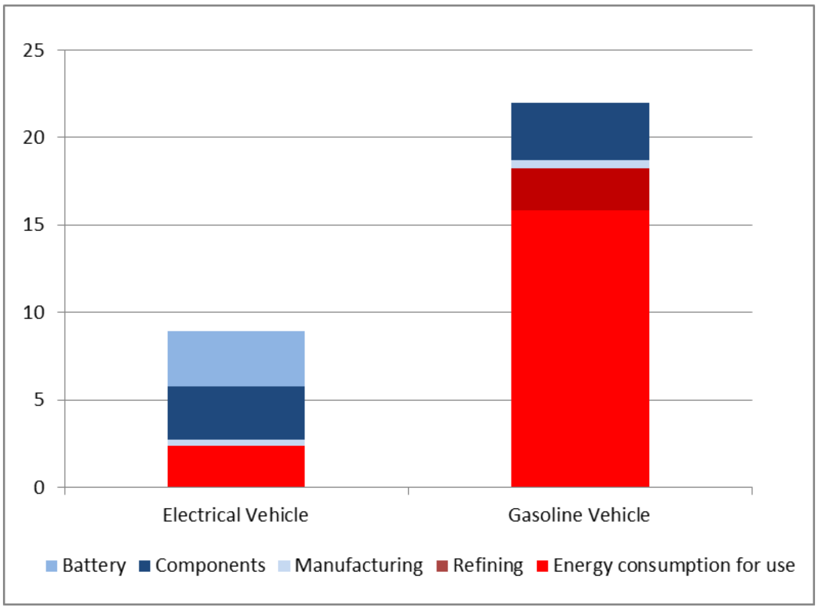

Figure 2. Potential of GHG Emission from Electric vs. Gazoline Vehicle (eq t CO_2).

optimism, it should be recalled that the goods discussed here are now relatively mature markets and that the gains that could be expected from a new generation of product may be fairly limited, especially if renewed often. The potential gains (in this case energy savings) may be depleted with one or two replacements, depending on product characteristics (ADEME, 2013). Refrigerators are a striking example: the most efficient models on the market in 2010 consume 170 kWh/year, compared to 320 kWh in average for the stock of appliances in use in France.

However, the analysis above focuses on energy, and therefore has a limited scope. The strength of LCA is to encompass other criteria, for instance waste impact or refrigerant losses from refrigerators, an impact that would not be eliminated, and probably aggravated, by rapid renewal of products.[2] Other types of action, such as materials recovery and recycling, and promotion of the circular economy[3], must systematically be implemented in parallel with renewal.

Vehicles

The life cycle analysis referred to here was led by ADEME (Gingko 21 and PE International, 2013). The observations made above regarding home appliances also hold for internal combustion vehicles, in terms of climate change in any case (t $eqCO_2$). For gasoline vehicles 83 % of the impact is due to fuel production and consumption. The remaining impact due to vehicle manufacture is thus 17 %.

In addition to this observation, the assessment of electric vehicles is interesting because we see a reversal of these relative impacts. With a new energy carrier, it becomes logical to keep the vehicle and its battery as long as possible in terms of km travelled.

GOODS FOR WHICH 80 % OF IMPACT IS DETERMINED BY MANUFACTURING

Textiles

Life cycle assessment confirms intuitive thinking about textiles: the main impact is linked to product manufacturing, between 60 and 70 %, depending on the criteria. The second most significant impact is due to use, with washing, cleaning and ironing of textiles. Extending textile product life therefore makes sense, for these goods with an environmental footprint largely due to manufacturing and end-of-life disposal.

Computers, smartphones and high-tech appliances

Computers and smartphones are an interesting case. Even though these devices consume energy in use, whether plugged in continually or during battery charging, their environmental impact is mostly due to the manufacturing of components (computers show an energy impact more closely balanced between production and use). Only 10 % of the GHG emissions are due to the use for a computer, and even less than 5 % for a smartphone. In these examples from high-tech products, it is clear that expanding lifespan is a good mean to reduce environmental impacts of the product.

Strategies and recommended action by product category and stakeholder

TWO CATEGORIES OF GOODS, TWO TYPES OF RECOMMENDATION

Considering these examples that are fairly representative of the diverse situations encountered and the divergent environmental impacts, it is not possible to edict a single set of recommendations to prolong product life for all types of goods.

Roughly speaking, two categories of goods can be distinguished. Common consumer goods for which impacts are due

2. The term "waste impact" is used here in a simplified way. In practice, different waste treatment options and conditions can lead to very different impacts per tonne of a given type of waste. For this reason in LCA studies waste in itself is not considered to be an impact, but the outcome of waste treatment is taken into account.

3. The essential stages of the "circular economy" are Ecodesign, Industrial Ecology, Economy of Function, Reuse, Repair, Refurbishment, Materials Recovery and Recycling (Source: ADEME). It is in opposition with the current model which can be defined as a linear economy (extraction, consumption, waste).

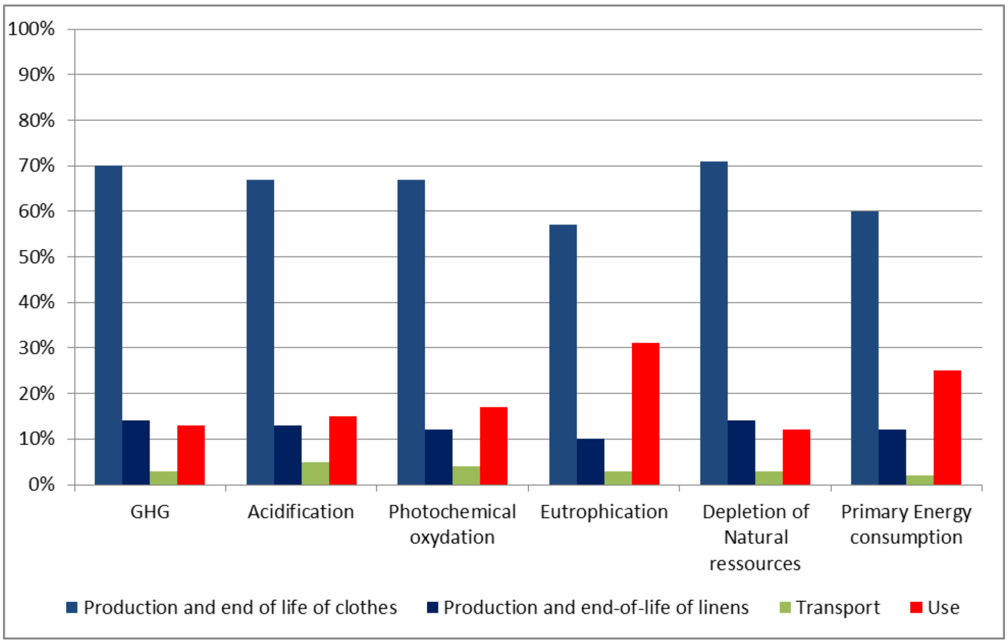

Figure 3. Share of Impacts of textiles from Life Cycle Analysis.

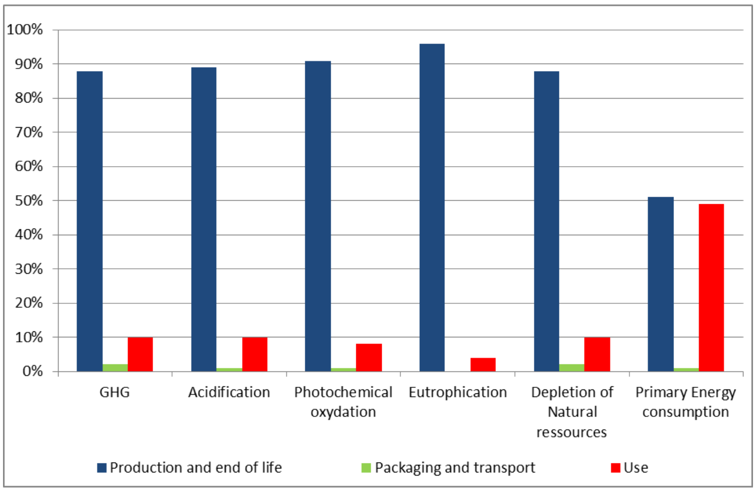

Figure 4. Share of Impacts of computers from Life Cycle Analysis.

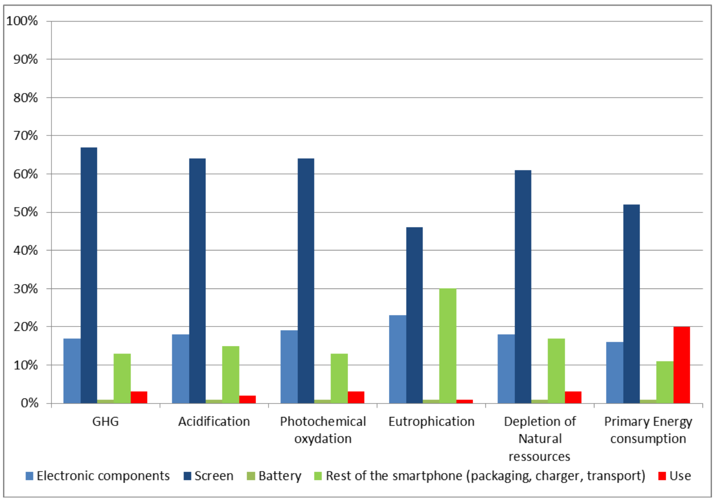

Figure 5. Share of impacts of smartphone from Life Cycle Analysis.

Table 1. Measures by type of product and actor.

	Goods for which manufacturing impact > use impact Up to date objects	Goods for which use impact > manufacturing impact Investment and Workhorse objects
Supply side	– New economic models: economy of function, circular economy, competitively priced repairs vs. renewal – Ecodesign and modular products – Sturdier products – Information on duration of use on a “reference” case	– If untapped environmental gains exist, technical progress to improve efficiency should be disseminated as widely and "rapidly" as possible. – If not, maintenance, upkeep and repair networks should be set up.
Demand side	– Encourage new attitudes to objects: conservation, repairs, exchange, sharing – Identification, personalization	– Promoting proper assessment of needs, matched by moderation in use

to manufacturing and not to use – a category for which product life should be extended. And consumer goods for which use impact is greater than for manufacturing – goods that should be more rapidly renewed. But in the light of the complex LCA results, it is not enough to simply call for “replacement”, even for this second category.

The shared responsibility of manufacturers and consumers

Recent studies quoted before, in France and in the United Kingdom, have shown that roughly one-third of consumer items are replaced while they are still in working order. In these circumstances, responsibility for accelerated obsolescence seems clearly shared between manufacturers and consumers.

More responsible manufacturers

It is far from obvious that manufacturers encourage or plan obsolescence in competitive markets, even if the competition is imperfect (Waldman, 2003). While situations of abusive practices may exist, it can be assumed that they are punishable under current laws on competition, and will not be the norm if legal processes are upheld.

Given the scope of the environmental crisis, however, we cannot be content with products simply designed to “last longer”. Despite all the limitations and inevitable losses, recycling must be the norm at the end of product life. In addition to renewal, the strategic and/or harmful components of all products should be recovered, reused or reprocessed. Along with eco design, these are among the basic principles of the circular economy.

Furthermore, under certain conditions, functionality economy (the shift from ownership to service) could drastically reduce the number of “objects” required to furnish a given volume of service. For example, with car sharing, and therefore fewer cars on the streets at any given time, it will be possible to reduce the consumption of materials. Mobility needs can be satisfied with a smaller quantity of materials, when cars are used successively, and not simultaneously.

Articulating functionality economy (car sharing, carpooling …) and circular economy (especially massive recycling), the amount of materials needed to produce two cars could be nearly halved. Although there are always some losses in a cycle and non-recyclable components (De Guillebon and Bihouix, 2010), knowing that a shared car can replaces nine vehicles in the first car sharing systems developed in France (6T, 2012), we can calculate potential gains …

Changing behaviour in relation to certain products

Considering work done by Brook Lyndhurst for Defra, the three categories of goods determined by the relationships that consumers have with the product are operational to make some suggestions.

In the Investment and Workhorse categories, the behaviour of consumers is not too problematic. The products are generally replaced at the end of their useful life (barring some exceptions previously mentioned, goods that could be kept or repaired).

But when it comes to products in the Up to date category, the responsibility of consumers but also marketers and advertisers should surely be called into question, as these products are systematically replaced before the end of their useful life. Steps to slow the pace of systematic renewal are indispensable – information, awareness-raising, appeals to build responsible consumer attitudes, but most importantly strong economic incentives to keep products that are in good working condition, with a delicate balancing act to avoid this action being seen as a barrier to innovation.

Furthermore, the relationship to objects is a complex social construct, involving value systems that are the fruit of many different interactions. It means that transition work has to include value system in order to be successful. Some authors (Veblen, 1899 and Baudrillard, 1986, to mention just these two) have devoted work to describing these systems, but it would be singularly risky to try to inflect these values with a “top-down” or normative approach. Consumer’s choices are a result of different logical choices which are results from personal choices, social norms, laws …

Planned obsolescence does not appear to be a useful working notion for thinking about the environmental transition and working to achieve it. This notion is too broad, and aggregates too many categories of products; it does not enable us to grasp the mechanisms and outcomes associated with different products. Our recommendations are based on a synthesis of the classification system outlined by the Brook Lyndhurst–Defra study and the LCA methodology that ascribes environmental impact to the manufacturing phase or the use phase.

The resulting assessment does not have to be definitive for a given product, as illustrated by the example of automobiles: the environmental impact of gasoline vehicles comes during use, while electric vehicles have the greatest environmental impact during manufacturing. But this analytic grid can spark discussion and serve to define some general principles for concrete and operational measures to address the multiple situations that arise, depending on the type of product. In any event, it is intended to advance our thinking about a current mode of consumption that is unsustainable.

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