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Visualizing and Overcoming Planned Obsolescence as Destructive Force

Naina Parasher, 11681977,
Marleen de Jonge, 11987502,
Nina Fistal, 11275774
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Introduction

In this paper, we present a problem analysis from a degrowth perspective concerning planned obsolescence, through a case study of the American multinational technology company Apple Inc. We do this through a thorough exploratory discussion of planned obsolescence, its environmental impacts, the recently advocated idea of the circular economy and its limitations.

By Degrowth, we "understand a form of society and economy which aims at the well-being of all and sustains the natural basis of life." (Degrowth.info, n.d.) We consider degrowth a system that strives for sufficiency and a good life for all which includes deceleration, time welfare and conviviality; thus reducing production and consumption in the global North and self-determined social organization in the global South, while following democratic decision making to allow for real political participation. (ibid)

We start by presenting a background for the concept of 'Planned Obsolescence', its origins and its current presence in the economy, its connection to the environment and the circular economy. The paper then presents the case study of Apple Inc. and elaborates on the concepts of circular economy. These discussions are also supported by stock and flow models to present a clear understanding.

With the increased ubiquity of technology in our lives, it is essential to understand that the idea of planned obsolescence was first presented as a solution to end the Great Depression. Following the basic foundations of Capitalism, this idea of deliberately creating and designing devices prone to have a short lifespan is still being followed in order to maintain profits in the current competitive consumer market. This is further promoted through notions of consumerism and marketing techniques. These ideas have an acutely damaging impact on the environment due to the disposal methods of these electronic devices. The hardware of most electronic devices is made from non-biodegradable metals and chemicals. These are disposed of in landfills and contain toxic and harmful substances which have an adverse effect not just on the soil but on the food chain itself, thus directly impacting not just the civilization surrounding the areas where they are disposed but also the planet in general. These issues are further explored through the case study of Apple Inc.

As an alternative to the current economic system which presents us with this issue, the theory of the circular economy is often recommended. This paper does an exploratory research into the concept and goes on to present solutions of its own and discussions regarding the viability of those solutions. The paper aims to answer the following research question:

How can the problem of planned obsolescence be discussed from the degrowth perspective and what could be a viable solution framework?

Problem Background

"Planned obsolescence was created to boost capitalism. The very idea oozes financial progression for companies. It gets consumers spending money; money that would have remained stagnant. When the money circulates, then more people and companies benefit leading inevitably, at least in a short-term, to a prosperous lifestyle." (Keeble, 2013) This prosperous lifestyle, being often short-lived for the consumers and with longer impacts for the producers and manufacturers. The term, 'Planned Obsolescence', was first coined by Bernard London in 1932. A concept birthed from Capitalism, this was proposed as a solution to end the Great Depression. (London, 1932) A policy commonly used by various international companies of 'planning and designing objects with a verifiably limited useful life'. (Zallio and Berry, 2017) This paper, henceforth, when referring to 'Planned Obsolescence', uses the definition - 'when a product is directly designed to have a specific short life expectancy, so the customers will have to make repeat purchases.' (Bulow, 1986). This policy has been adapted and exercised by most manufacturing and industrial companies, where engineers and designers played an elemental role in a deliberate devaluation of certain qualities of the product to shorten its lifetime and increase profits in a competitive market where consumerism was one of the main aims. (ibid)

Consumerism is an intrusive and manipulative system that is intricately linked with the economic philosophy of neoliberal capitalism that has dominated the West in recent decades. (Mahajan, 2015) "Mass consumer interest sparks mass competition from companies trying to gain the attention and consideration from the consumers. It is a complete turnaround from previous; consumers are the ones influencing companies' behaviour instead of companies influencing consumers' behaviour" (Keeble, 2013) This can often also work vice versa using marketing and advertising techniques. "Once technique takes root in society it operates according to its own "internal necessities" rather than external necessities of society or individuals. The technique is independent of moral and spiritual values, since its continuous progress is not determined by anything outside of technical determinants and criteria." (Zoellick and Bisht, 2017)

As technological innovation is taken to the foreground, it also brings with it a growth in the world consumer electronic market with higher expenditure on web-based services and an increased demand for data from the network. This presents mainly two effects: our increased dependency on web-based devices and 'Devices, in particular, IoT-based and smart products, are becoming obsolescent in a shorter time than a few years ago, due to various reasons.' (Zallio and Berry, 2017)

The issue of 'Planned obsolescence' being an inherent quality of electronic devices has been largely debated. When talking particularly of electronic media devices, "electric tools are prone to technical and psychological obsolescence. Though their longevity depends on the materials used and the quality of manufacture, it is either technically reduced or newer products are marketed in a way that durability, maintenance, and repair become less prioritized. Both aspects are due to the capitalist need to increase profits through sales of new products (Bulow, 1986), and both in different ways demotivate repair and increase waste." (Zoellick and Bisht, 2017)

This increase in e-waste has direct impacts on the environment, containing non-biodegradable and toxic chemicals when disposed of in large amounts in landfill create an adverse effect of the land. While these harmful chemicals often seep into the soil and enter the food chain, they are also the reason for severe physiological or neurological defects, infertility, breathing disorders, skin problems and cancer among e-waste processing workers. (Patil, 2016) This issue persists even in countries where e-waste disposal is regulated and recycled, Ahmed states that of the $206 billion spent on consumer electronics in the U.S. in 2012, only 29 percent of the resulting e-waste generated was recycled. (2016) (This is also discussed further in other parts of the paper.)

Often, solutions presented have similar lines of thought, most common being the circular economy, which we shall also be exploring further in this paper. The circular economy is a concept which perceives the new economy as a closed loop wherein the resources available are used for as long as possible, extracting their maximum value and recovering and regenerating materials at the end of their product lives. Thus, making the circular economy "not an 'alternative discourse to economic growth', but rather an 'alternative growth' discourse." (Charonis, 2012) Other sources claim the transition to the circular economy to aim "to proliferate these established norms of reusing, repairing, refurbishing and recycling materials and products, as well as 'designing in' greater product longevity and repair-ability from the outset. Waste is thus revalued and turned into a resource, and products are consciously (re)designed to create materials flow that keep value added for as long as possible." (Hobson and Lynch, 2016)

Case Study

In the previous sections, we have elaborated the general concepts and implications of planned obsolescence. In this section the actual practice of this strategy will be explained based on a case study of one of today's leading tech-companies Apple (Jones, 2018).

Apple is one of the most powerful brands in the world and the company has been dominating the electronics market since long time. In 2016 Apple owned already 79% of the global smartphone market shares, indicating that the brand is urged to adjust their business model to make profit even when so many people are already provided a working iPhone . The most forward way to increase demand for their product is to shorten the lifespan of the product.

Apple has never been reluctant to use methods to reduce the obsolescence (Dannoritzer, 2010) . By now the company faces a big lawsuit in France for intentionally slowing down the CPU and the iPhone 5 was received with fierce criticism for making all former peripheral accessories useless.

In the beginning of 2018, a lawsuit started against Apple, after admitting that a former software update in early 2017 slowed down the CPU of older models. The company substantiated the update as a way of avoiding phones to shut down at random. However, this was never mentioned during the update. Currently, the case is still being investigated (Vonk, 2018).

To get the CPU back at regular speed, the battery can be replaced by Apple with a charge of seventy-nine dollars. iPhones can barely be repaired by external parties, since the smartphone resembles a closed black box, of which the components cannot be accessed (Umar, 2010)

Apple's mechanisms of obsolescence

Planned obsolescence has proved to be useful as early as the Great Depression in the 1930s (London, 1932). The concept was introduced as a means to solve the crisis from the Great Depression; to artificially create demand when people hold on to older durables. Guiltinan distinguishes two different types of obsolescence. Mechanisms of both physical and technological obsolescence can be applied to boost demand (Guiltinan, 2009).

First of all, the lifetime of a product can be shortened by quite literal 'death dating'. It has been common practice for a lot of technological products to be designed for a certain amount of years (Slade, 2006).

A subtler practice of planned obsolescence is the design of products that can be repaired very limitedly. The strategy of Apple is an obvious example of this: iPhones resemble a closed box of which the user cannot get access to the individual components. Thus, when the battery life of an iPhone falls, the phone can only be repaired by Apple itself for a substantial price.

At last, physical obsolescence also contains design aesthetics that boost the desire of customers to buy a new smartphone. Apple introduces slimmer and lighter designs with every new edition, promoting early disposal of former products.

Obsolescence can also be applied in a more technological way. In the last part of the 20th century fashion has become more and more dominant in contrast to durability. As mentioned earlier, Apple is a very present adapter in this strategy as the company focuses on selling a 'lifestyle' more than selling just a product.

Finally, software updates often reduce the lifespan of a smartphone. As stated earlier, Apple is already facing a lawsuit for updates that depreciate older products. It is often impossible to abstain from updating the products, since many applications can only be implemented on newer versions.

Visualizing the problem

Effects and causes of planned obsolescence are visualized in a stock-flow diagram in Figure 1. This diagram does not portray the situation as a whole. In further research of the topic, sociological effects and situations should definitely be paid attention to. For the sake of a comprehensible topic, this paper mainly discusses the environmental factors.

One important stock in the diagram is the minerals stock. This stock is non-renewable and will thus face severe problems with continuous growth in smartphone production. Next to this, special attention should be paid to the marketing strategy (Fig. 1). As can be seen in the diagram, marketing creates a reinforcing feedback loop in the process of obsolescence. Marketing increments the desire to buy a new smartphone; via product sales this, in turn, increases company revenues and part of the revenue is spent on more marketing; a bigger lifestyle to sell. In this way, the electronics market is continually growing. This results in an incrementing amount of e-waste.

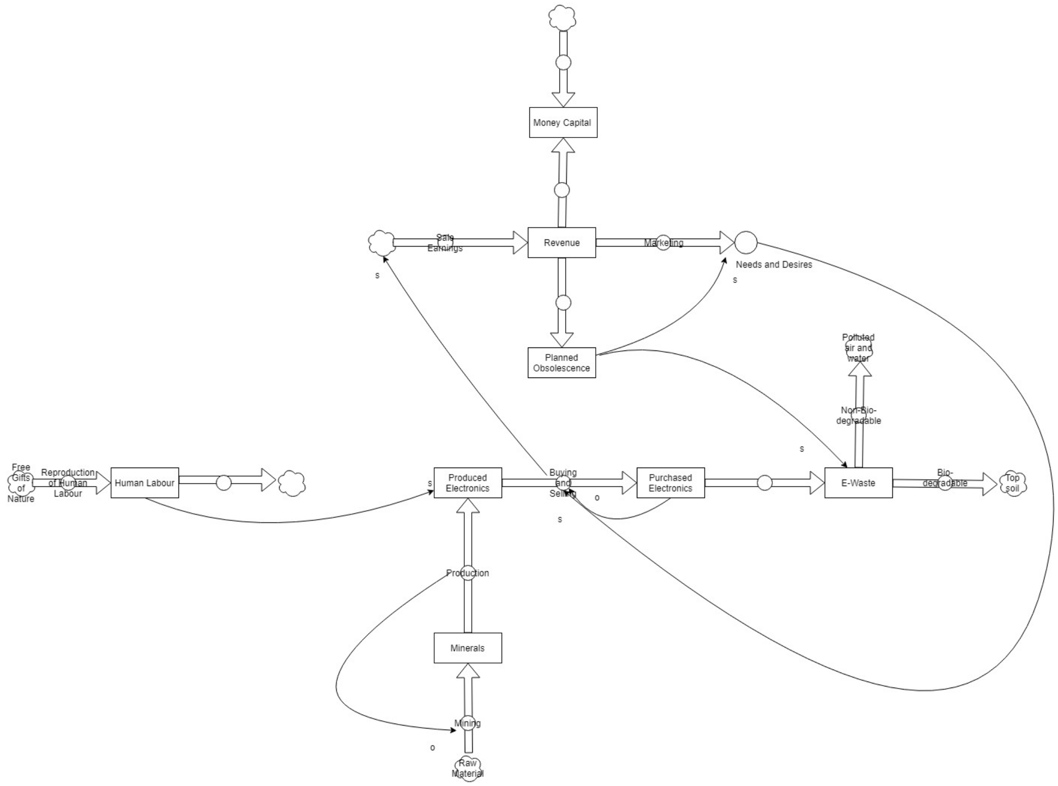

Fig. 1: stock-flow diagram of production and consumption of smartphones. Marketing strategy is boosted by revenue and stimulates needs and desires and therefore incrementing consuming.

Environmental and health-related implications of incrementing amounts of e-waste

Apple holds some kind of justifying explanation for all these obsolescence symptoms; slowing down the CPU is said to be necessary in order to prevent the phone from shutting of unexpectedly for example (Vonk, 2018). One can therefore give the nature of these product development strategies the benefit of the doubt. Nevertheless, the fact remains that many environmental problems are driven by these kinds of obsolescence.

As described earlier, technological strategists require a rapid sequence of innovated products to keep up with their competitors. Replacement products are introduced multiple times a year and motivate customers to replace their – still functioning - durables (Guiltinan, 2009).

Next to this, the design and marketing departments of tech-companies drive customer desires by incorporating new luxury features with every new edition. Apple is said to sell a lifestyle, more than a product. With every new iPhone edition, customers rush to keep up with the comfortable Apple lifestyle. However, these marketing strategies, focusing on continuous growth and improvement, do not embrace recyclability at all and use components that leave no room for sustainable innovation (Guiltinan, 2009).

In combination, this results in consumers disposing of their non-recyclable products every one or two years (see Figure 2). The rare and costly minerals, that smartphones consist of, are lost in this way and a lot of e-waste is produced. According to the United Nations, by 2020 it has been estimated that the EU alone will produce more than 12 million tonnes of E-waste per year (Nnorom & Osibanjo, 2007).

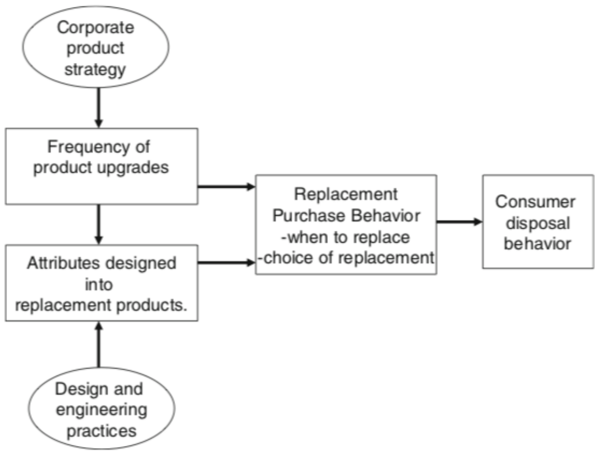

Fig. 2: A diagram of marketing strategies boosting planned obsolescence

Although it is actually prohibited by the Basel convention, e-waste is shipped in large amounts from developed countries to less developed countries, where second-hand phone markets are steadily expanding (Robinson, 2008). This is problematic since these less developed countries often lack the proper infrastructures to recycle or dismantle electronic waste (Nnorom & Osibanjo, 2007). The electronics that cannot be sold again because of decay, either end up in landfills or are being burned or dissolved in strong acids (Robinson, 2009). This causes toxic chemicals and metals to leak into groundwater and contaminate multiple food chains (Sthiannopkao & Wong, 2012).

Circular Economy

The Ellen MacArthur Foundation defines a circular economy as "an industrial economy that is restorative or regenerative by intention and design" (2013). The circular economy is often regarded as the newest idea regarding the "the integration of economic activity and environmental wellbeing in a sustainable way"; it is often represented as an alternative to the existing linear economy (Murray, Skene, Haynes, 2015).

The current environmental conditions are deteriorating at an exponential rate due to the existing economic model, where the GDP growth remains the essential goal (Raworth, 2017); without focusing on the effects that such growth has on both society and environment. Several planetary boundaries that define "a safe operating space for humanity based on the intrinsic biophysical processes that regulate the stability of the Earth system", have already been crossed which poses a significant threat for the future of humanity (Richardson et al, 2015). Thus, a lot of frameworks were proposed with regards to sustainable development, and creating alternatives to the contemporary economic activities, including encouraging corporations to restrain from "business as usual" strategy and take more steps towards sustainability (Murray, Skene, Haynes, 2015). "Circular economy" is one of the most recent concepts, related to older frameworks such as "Cradle to Cradle", "Performance Economy", "Biomimicry" and "Industrial Ecology"; all of them revolving around the idea of "economy in loops" and around replicating the nature's idea of metabolism as well as "eliminating the concept of waste" (Ellen MacArthur Foundation, 2018). The circular economy is itself a not a narrowly defined concept, as it is often described in a multitude of ways, revolving around the ideas of "recycling, reusing and reducing" (Kirchherr, Reike, Hekkert, 2017) and "decoupling" - separating growth in economy from the environmental impact (Fletcher and Rammelt, 2016).

The proponents of circular economy emphasize the importance of "long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling" (Geissdoerfer et al, 2016) within the circular economy framework, thus emphasizing the fact that circular economy allows for reduced waste of resources, as it could otherwise lead to depletion of "free gifts of nature" and pollution. Moreover, the circular economy is thought to provoke less consumerism, by decreasing the ownership and focusing more on "bartering, exchange, or gifting", as well as introducing the models where consumers share goods and services (Hobson and Lynch, 2016). It allows to individuals to borrow resources, to reuse them, and to leave a smaller negative footprint as a society.

Despite all the benefits of the circular economy, this framework poses a variety of challenges. Firstly, the concept of "decoupling" that is often considered in the discussion about the circular economy, is not viable in the long term, for instance, due to the "rebound effect": while there is an initial increasing efficiency from using a certain resource, this still leads to more growth and larger use of this resource (Fletcher and Rammelt, 2016; Zink and Geyer, 2017). The circular economy is not as efficient as described by many owing to the fact that circular economy is not able to "escape" entropy, which always increases, thus forcing energy and matter to "dissipate with time". The example of this could be the eventual disintegration of the recycled plastic and its particles still damaging the environment (Fletcher and Rammelt, 2016).

There are also many claims made about circular economy with regards to the fact that it will allow reducing the detrimental effects of the planned obsolescence by recycling the technology that would otherwise be discarded (Satyro et al, 2017). However, this idea could be problematic owing to the fact that not all products, especially mobile phones such as iPhones that are claimed to be recycled in a circular way: the damage to the environment as well as the society would still be caused. In the first place, according to Valenzuela and Böhm (2017), many companies such as Apple create the “green” image and “rhetoric” without disclosing which parts of the devices are actually recycled, and to what extent. This makes planned obsolescence detrimental even in the context of the circular economy, because some of the phones or their details are not and cannot be recycled. Secondly, even if the phones are recycled completely, such cycle cannot continue for extended periods of time due to entropy that was mentioned earlier: some parts of it will still remain and could damage the environment. Thirdly, even if the circular economy model is continuously executed, the constant production of devices due to planned obsolescence could result in an inability to successfully recycle all devices or all details from the devices. Also, despite the fact that circular economy framework claims to be a viable solution to the existing ecological issue because of the recycling aspect, it is important to remember that recycling itself still requires high amounts of energy (Westervelt, 2012). Since Apple and other technology companies are constantly pursuing innovation, the numbers of phones produced increases, and the “dynamic development of the mobile phone industry is linked to a rapidly increasing use of natural resources and energy”, both producing new phones and recycling a large number of older ones leads to significant costs from the energy perspective (Welfens et al, 2015). The circular economy cannot be a solution, if the constant economic growth still exists, and more and more products are created every year (Hobson and Lynch, 2016). It is also crucial to mention companies such as Apple are also known for its unethical labor conditions, and they are not likely to change drastically in the case of the complete implementation of the circular economy model (Merchant, 2017).

Figure 3 represents the systems thinking model where the current linear economic system is adapted towards the circular economy. In the model, the case’s focus is on the iPhone. Compared to linear economy model (figure 1), we can see changes in terms of the feedback loops regarding recycling, and reusing, and the increase in not only private ownership, but “sharing economy” aspect (Botsman, 2010) is observed: there is an increase in renting or borrowing technology. We can also see that the amount of e-waste is reduced. However, as mentioned earlier, circular economy would not be viable in the long run, due to both the fact that the economy is still growing and more and more goods are produced and consumed, as well as inability to constantly recycle technology because of the entropy aspect, that is also mentioned earlier in the paper. Furthermore, companies such as Apple could only be creating the image of a sustainable company, while still investing in the perpetual growth, create products that can only be used for two years, and not recycle all the waste that is generated. Therefore, a new perspective is needed to solve the issue of the planned obsolescence: the focus on degrowth framework.

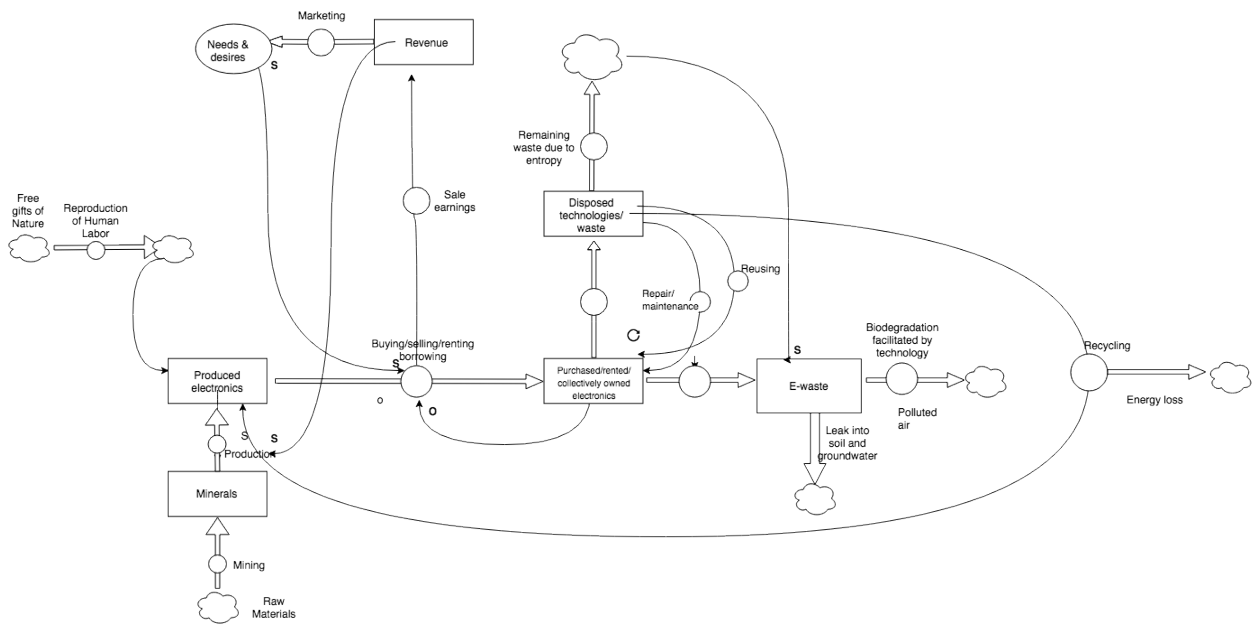

Fig. 3: Stock-Flow diagram of a circular economy

It is easy to criticise the phenomenon of planned obsolescence and discard it as completely undesirable. Nevertheless, it was suggested as an absolutely crucial solution to the great depression in the beginning of the twentieth century. Growth in commodity market eventually requires obsolescence and because of the fact that the desire for growth is so deeply embedded in today's economy, there is an urging need to rethink obsolescence (London, 1932). In the next section, we will explore the possibilities of sustainable obsolescence.

Alternatives to Planned Obsolescence

Legislation

Prevention of intercontinental e-waste flow

The first part of a crucial degrowth policy is to intervene in current legislation. As stated before (see Case Study), disposed phones and other electronics often get sent to developing countries where the demand for second-hand electronics is rising steadily. In this way, developed countries in which large amounts of e-waste are generated can get rid of the waste without having the costs and effort of recycling it (Robinson, 2009). Unfortunately, the countries that receive the second-hand electronics lack the appropriate infrastructures to recycle or process the unusable electronics and therefore serve as digital dumps. It is the goal of a proper degrowth policy to prevent these e-waste dumps by all means.

Therefore, the first proposal will be new legislation to prohibit countries to send their e-waste to less developed countries. This proposal will have multiple beneficial effects. First of all, it will prevent bulk flows to be moved along large distance and therefore cut environmental costs greatly.

Secondly, it prevents digital dumps to arise, since developed countries have better capabilities of recycling and proper dismantling of electronics. This will prevent toxic materials and metals to leak from the landfills, containing the e-waste, into the groundwater and contaminate agriculture. Less developed countries, in which these digital dumps are very present, like Nigeria (Nnorom & Osibanjo) will enjoy great benefits from this new legislation. It will prevent inhabitants to be physically harmed by the toxics in groundwater (Sthiannopkao & Wong, 2012). Next to this, prevention of digital dumps will preserve large parts of the land which can now serve other purposes.

Thirdly, it stimulates well-developed countries to recycle their e-waste, since there is no other easy option to get rid of the disposals (Cao et al., 2016). Developed countries will know that these digital dumps will be just as harmful to them and therefore improve recycling policies and infrastructures.

Then finally, it contributes to the relocalization of the electronics market, which is an important attribute of the degrowth agenda.

Eco - Taxes

The book 'The Utopia of Degrowth' presents four Degrowth policy proposals, by Giorgos Kallis, Florent Marcellesi, Herman Daly and Serge Latouche, all four of which present green or eco-taxes as one of the top ten proposals to achieve a functioning degrowth economy. The idea of green taxes, applied within the context of this paper, fits well as a legislative solution to the problem of planned obsolescence.

The core of the idea is not to increase the taxes but levy the taxes in a manner that forces the consumer to examine the carbon footprint of their lifestyle as the target audience of the market for the devices following the planned obsolescence design. As suggested in the book, "One option is a "carbon dividend", where the revenue from a carbon tax is returned as an equal share to everyone; another is to use the revenue to give tax breaks to low-income brackets." (Kallis, 2018) "The state can shape the distribution of surplus not only through taxation, social security and labor regulation, but also through investment policy" (ibid)

Wherein, in this case, the consumer market regulation determines the money distribution and the percentage of tax regulation also considering the environmental impact of the use of the devices and the Carbon Footprint caused by the energy consumption in the whole process.

The eco-taxes, though in this case suggested for the consumer side, can also be applied to the producers and manufactures to bring about a bigger change. The main purpose of the taxes remaining to be an incentive to reduce the environmental impact of the practice from both sides.

Limiting the demand side

Studies have shown that electronics disposal goes hand in hand with electronics production (Nnorom & Osibanjo). The more phones are being disposed of, the more phones are being bought and produced. So in order to bring back the production of electronics, it is important to inhibit early disposal. Early disposal of electronics is caused by a few factors.

As discussed earlier, smartphone brands like Apple implement physical mechanisms to degrade the phone's functionalities (i.e. slowing down the CPU with software updates, limiting battery life) which stimulates consumers to dispose their phones earlier than necessary. Next to this, they tend to focus their marketing strategy on the promotion of a luxury lifestyle in which the newest edition is always desired, even if the older one is still completely usable.

To prevent this early disposal (hereby specifically in the phone sector) the next legislative proposal is to limit the number of phones that is allowed per person per specified period of time. This will bring back the production of smartphones and therefore also the disposal of smartphones. This legislation will also favor the smartphone brands that produce longer enduring more stable devices.

Producer responsibility

Finally, we propose to impose responsibility for recycling a product upon the manufacturer of that product. This means that the producer takes responsibility for the entire life span of a product. By laws and regulations the company has to take care of collection, dismantling and reuse of their electronic products (J. Cao et al, 2016). Studies have proven this manufacturer responsibility as more efficient than to tax electronic waste (Atasu et al., 2013).

To set such a 'take back' policy will encourage smartphone brands to take recycling efficiency into consideration in the product design. Currently, this is barely happening (Pagell, Wu, and Murthy, 2007). Little of such policy has been designed or experimented with, but in the few countries where this legislation has been introduced has proven to be successful. After shifting take-back responsibility in Japan from the government to the private sector for example, the recycling efficiency doubled (Ogushu and Kandlikar, 2007).

One side note must be made in this matter. A hundred percent take back policy has shown to be poorly feasible, since such a policy becomes very costly for companies. If the costs to recycle the whole batch of products become bigger than the costs the government impose in its take back policy, digital dumps might still continue to occur (Toffel, Lee & Stein). Therefore a ban on digital dumps might be an important additional legislative restriction.

Social Measures: Community, education and participative democracy

While the modified legislation is intrinsic for solving the problem of planned obsolescence, the initiatives on the local level within the scope of communities or cooperates can make a significant impact on reduced consumption. Smaller communities with values such as "sharing" and "strong relationships" as well as the goals such as "localized production", "direct democracy", and sustainable lifestyle (Kallis, 2018), could introduce frameworks that contribute to solving the environmental issues in general and the problem of planned obsolescence in particular. When talking about such communities, we could even discuss the neighborhoods, where individuals self-organize while still being in the "interactive relationship with institutions", where the knowledge about the urban development of the community, the sustainability, and the commons is shared through peer-to-peer networks, with stakeholders such as policy makers, social entrepreneurs, environmental scientist and self-builders being actively involved in the process of the creation and prosperity of such communities (de Waal and de Lange, 2018). The examples of such communities already exist all over the world: from de Ceuvel in Amsterdam to Auroville in India (Namakkal, 2012). It is also essential to mention the non-hierarchical structure of such communities, as well as the decentralized initiatives and "governance of a federation of communities working towards the circularity of digital devices" (Franquesa, 2016).

From the perspective of degrowth, the existence of such communities would be justified and even encouraged, since these communities are not aiming for the mainstream capitalist "growth", rather they focus on the localized initiatives with regards to managing their common resources, waste-management or the idea of "closing resource loops", in the most energy efficient ways possible, while operating in "political safety" (Robbins and Rowe, 2002). To further describe the idea of such community and focus on the concept of planned obsolescence, the following points will be addressed: the circular economy in the degrowth context within the community, sharing and reusing the technology, the local currency or the bonus point system, as well as education regarding degrowth within the community.

According to Hobson and Lynch (2016), while the idea of Circular Economy is viable, but it does not address the challenges such as “rebound effect and hyper consumerism”, and does not eliminate the constant innovation or constant replacement of materials or devices with their newer versions, which are produced in different parts of the world and the transportation of which has an environmental costs as well. However, the circular economy model existing in this communities would not include the consumerism aspect, rather, this model would exist in terms of the members of this community being involved in processes such as composting, rainwater collection, utilization of solar and winter and introduction of the “cascade recycling systems” (Kim et al, 1997). In this case, the community members do not purchase the phones, particularly iPhones, at the increasing rates and do not contribute to the issue of “billions of phones manufactured worldwide” (Welfens et al, 2015). The individuals within the cooperative have a collective understanding of issues connected to the detrimental effects of the constant growth (D’Alissa, Kallis, Demaria, et al, 2014). The use of technology such as Fairphone, which is “a world’s first modular phone built for repairability in mind” (Fairphone, 2018), becomes more common (Fairphone, 2016), as this phone is suitable for reuse and repair, rather than being disposed of. The recycling of the parts of the Fairphone on a local level would require energy, however, these expenses would still be lower than energy needed to producing and transport the new phones, only 10% of which are recycled in the contemporary society (Welfens et al, 2014).

Apart from the circular structure that facilitates recycling on a local level, the ideas of sharing, co-ownership and “non monetized altruism” are crucial in such community (Johanisova et al. 2013). Individuals within a neighborhood could collaboratively be using technology, instead of purchasing new items, and such form of gift economy could be facilitated by both, an am open-source platforms, where all transactions are recorded (de Lange and de Waal, 2018), but also face-to-face interaction, which strengthen the trust within the community. According to Johanisova et al (2013), in the case where the “the real needs” of individuals, including the sense of belonging to a like-minded group of people, a sense of being understood, and the sense of trust, are satisfied, the desire for “growth” and consumerism becomes less strong and significant. When becoming a part of the local sharing economy and cooperating with neighbors, and thus “fostering social equality” (Cherry and Pidgeon, 2018), individuals could be more interested in sharing their technological knowledge with regards to repairing the phones, facilitating peer-to-peer exchange of parts of the phones and collectively finding ways to manage technological obsolescence, while working together with experts in technology industry and local entrepreneurs.

However, even despite the fact a lot of the values described above could be an intrinsic motivation for individuals, it would also be interesting to explore the idea of local currency or bonus system, that encourages the community members to reuse and recycle their smartphones. As stated by Seyfang and Longhurst (2015), the "parallel systems of exchange, designed to operate alongside mainstream money" can be applied for meeting the "additional sustainability needs". Individuals could be using that complementary currency within their community for being involved in the initiatives relating to reusing and recycling the phones and technology in general, and, for instance, use this currency for it in the local sustainable shops or restaurants. Brenes mentions that the introduction of such currencies can "enlarge local economy", both financial, social and "energetic".

However, it would not be possible for individuals to work together towards degrowth, reduced consumption and improved environmental conditions without the education that starts from an early age. There are countless initiatives that "emphasise the need for a change in design thinking and education about and for sustainability" and degrowth (Andrews, 2015). If this knowledge, as well as the idea of individuals working together on a local level, and reusing technology rather than pursuing constant growth and overconsumption globally, is communicated to children in schools, there is a higher chance of the paradigm shift (Meadows, 2008) and the changes in values among the population.

Mushrooms and microbes for recycling processes

To help recycle e-waste there is a lot of room for improvement to be made in the use of fungi/mushrooms. Fungi contain large webs of mycelia. These mycelia live in a symbiotic relationship and exchange rare minerals for energy. It has been proven that certain fungi can retract gold from old electronics in substantial amounts (Bindschedler et al., 2017). But fungi are also capable of capturing toxic metal ions. Experiments with fungi have shown that Pb ions can be removed from e-waste through the use of fungi (Ramasamy et al,. 2011).

Even after instituting the legislation policy we have spoken about on the previous pages it will be hard, if not to say impossible, to prevent all forms of dumped electronic waste. Therefore it is important to use fungi and other biological innovations for the dismantling of this waste. Contamination of groundwater and agricultural goods is an important problematic consequence of electronics disposal. By retracting gold and minerals from disposed electronics, depletion of these costly stocks can be overcome and by removing toxic ions from groundwater national health can be improved.

Unfortunately, current recycling processes of phones focus mainly on gold and precious metals and less research has been done to remove toxic materials. Our other proposals concerning legislation can contribute to research to better methods for recycling.

Next to waste directly from the phones, there is a lot of waste in the form of plastic that is used for boxing the phones and attributes. For this microbes and fungi would also serve right, since they can decompose both synthetic and natural plastic materials (Shah et al., 2008).

Blockchain as a Solution

Certain blockchain ideologies bear resemblance to the complete democratic (socially) and degrowth supportive ideologies presented earlier in the paper. The use of blockchain technology as a basic framework can be presented as a solution to the current issues with the transfer of energy in using and transporting technology through various countries. “One company, for example, is developing a digital currency and blockchain (Chia), which proposes to ‘farm’ rather than ‘mine’ — the idea being that unused storage on hard drives is utilised rather than processing power.” (Jackson, 2018) Blockchain could help increase energy efficiency for energy and money transactions and use the unprocessed storage generated through planned obsolescence. This could also help reduce the incentive to buy new devices as well as reduce wastage while having a positive impact on the environment. “A recycling program on the blockchain could encourage participation by giving a financial reward in the form of a cryptographic token in exchange for depositing recyclables like plastic containers, cans, or bottles.” (Future thinkers, 2017) Other ideas of using Blockchain include:

- Blockchain can be used to track environmental compliance and the impact of Treaties — decreasing fraud and manipulation.
- Donations to charities can be tracked to ensure that they are being attributed efficiently and as planned.
- Products can be tracked from origin to source. This can help reduce carbon footprints, increase ethical accountability and reduce unsustainable practices.
- Schemes such as recycling can be incentivised by offering token rewards to participants.
- Peer to peer localised energy distribution is possible, rather than the current system of a centralised hub.
- Blockchain can also be used to track the carbon footprint of products, which can then determine the amount of carbon tax to be charged.” (Jackson, 2018)

While these ideas present plausible and futuristic solutions to current problems, one does need to note that the current applications of the technology are quite damaging to the environment. It is estimated that Bitcoin alone has an impact of approximately 2.358 million cars annually in terms of Carbon emissions. (Reed, 2017) Although, it is believed that innovation in this field will yield better results for our future, the feasibility of it remains questionable.

Limitations

The authors of these paper realize certain limitations of the scope covered within these papers as well as the solution strategies presented. This paper does not cover in detail the social aspects of the impacts of planned obsolescence and solutions to stop it, including (but not limited to) the issues of aggravation of financial inequalities, misuse of human labor, the inherent violations of the poor, and the overall social injustice which is often a direct result of technological innovation. The paper also presents a focused solutions strategy in terms of what the consumer sector of the market can do rather than finding a solution to the root of the problem, that is, a solution that could convince producers and stop planned obsolescence from the design aspect. The main obstruction we faced when presenting any solution, (especially in terms of stopping planned obsolescence in terms of hardware), in that field would mean a largely significant or a complete overhaul of the current systems in place, which we believed would be beyond the scope of this paper. On the software side of things, one could consider using Open Source Softwares but that would again be a solution for the consumer sector and not the producers and designers. This paper also does not indulge into the consumerism and marketing sector of the idea of planned obsolescence and its advertising as a 'lifestyle' although that is a significant part of the basic framework of the system and strategies regarding planned obsolescence.

Conclusion

This paper aimed at pointing the existing challenges in the field of sustainability, particularly with regards to the practice of intentional planned obsolescence, that is currently pursued by a large number of companies, including Apple; as well as proposing a diverse solution framework, which took into account the changes that could be made on a legislative, social, technological and environmental levels. The research question answered as a result was : "How can the problem of planned obsolescence be discussed from the degrowth perspective and what could be a viable solution framework?". The analysis and proposal were written from the perspective of degrowth: "a form of society and economy which aims at the well-being of all and sustains the natural basis of life." and where the economic growth ceases to remain the main goal for the governments, corporate organizations as well as citizens (Degrowth.info, n.d.)

In terms of methodologies, the literature review was the main tool in terms of collecting the significant information on the topic, however, the Systems Thinking diagrams allowed to visualize the processes that exist in the current economic systems, as well as the ones that could allow us to solve certain environmental problem caused by planned obsolescence.

The frameworks proposed were regarding legislation, that would restrict companies from exporting the technological waste into the developing countries, restricting individuals from excessive consumerism, and companies, Apple in particular, from not taking social and environmental responsibility; regarding building a strong community, where individuals would lead a lifestyle based on sharing, reusing and local production; regarding introducing Blockchain as a potential solution, as well as regarding innovative approaches in the biology sphere. The stocks and flows graph with our final solution can be found on the Figure 4.

While these solutions are complex for practical implementation and can not be applied to every single economy and culture around the world, they could become the foundation for further analysis and research, carried out by both scholars and individuals in the field of politics, sustainability and social development.

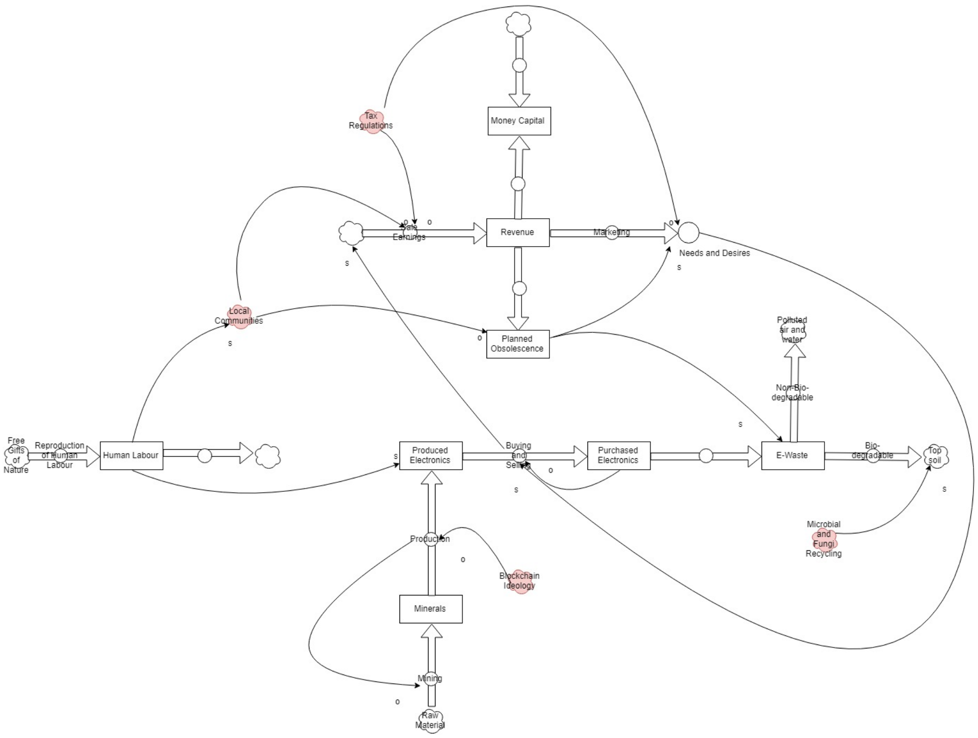

Fig. 4: Stocks-flows diagram with the integrated solutions.

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