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Engaging without greenwashing: a holistic gamified approach to foster eco-friendly behavior in a renewable energy crowdfunding platform

Guillermo Marchessi Riera

Thesis to obtain the Master of Science Degree in

Energy Engineering and Management

Prof. Susana Isabel Carvalho Relvas

Examination Committee

Chairperson: Prof. Jorge de Saldanha Gonçalves Matos
Supervisor: Prof. Susana Isabel Carvalho Relvas
Member of the Committee: Prof. Francisco Manuel da Silva Lemos

December 2021

Acknowledgments

First of all, I want to express that I feel very grateful to have been part of Seeds. Much has been learnt since the day this started in October 2019 to the day I left on June 2021; I could not have imagined that this experience would have helped me to live so many things in this short time. In two years, we were involved in two different acceleration programs, learned how to carry out whichever task was required in record time. Conducting user research, designing surveys and testing them, doing semi-structured interviews, creating affinity maps, doing thematic analysis, wireframing and prototyping, diving deep into digital marketing (which I profoundly hated), creating and tracking KPIs, designing websites, building a brand visual identity, doing marketing campaigns, paid advertisement, budgets, trying to efficiently manage a team of four people… in sum: a journey full of experiences and challenges.

This dissertation helps me to elucidate the deep inner questions I had when trying to play a good role as a marketing director in Seeds and at the same time trying to be faithful to my principles and values. Though many contradictions are still surfaced, as the subject matter cannot be addressed easily, I feel relieved to close this chapter with the greatest possible dignity and the same untouched motivation I had when I started the project, make the world a better place. I cannot close this chapter without wishing my colleagues the best success, hopefully this document can be helpful in their future journey.

Being this said, I would like to express my sincere gratitude to all of those who supported me throughout the writing of this hard thesis. First of all, I am grateful to my supervisor Susana who assumed the difficult role of supervising this dissertation, and made an outstanding work. Also, I would like to thank my friends Rubén, André, Susana and Eva for helping me through thick and thin. May our friendship stands the test of time and distance.

In the end, deepest thanks to my parents, sister and grandmother for their unconditional support and belief in me, and also a special thanks to music and painting for keeping my mind sound and sharp in these crazy last two years.

Abstract (EN)

To achieve the necessary transformation towards a low carbon society, it is obvious that all the coming technological innovations should also be accompanied by gargantuan shifts in lifestyle patterns. This study aims at identifying a possible gamified engagement strategy that fosters pro-environmental behavior for a renewable-energy projects crowdfunding app. Besides the growing interest of industry in gamification, there is few research on how to implement such approaches in a way it fosters pro-environmental behavior.

The research provides an integrative literature review of subjects such as environmental psychology, gamification and human computer interaction, to finally outline a comprehensive framework to guide practitioners in fostering sustainable behavior within the business world, in the context of a renewable energy crowdfunding platform, and also the analysis of a business case, *Seeds*.

While many game elements and marketing techniques can be positive for increased customer engagement and business development, they can be severely counterproductive as a strategy for climate change public engagement, and contrast sharply with the long-term sustainable practices that are required to transform to a climate neutral society. This work suggests that the corporate ethos might do more harm than good when it comes to fight climate change. Some widely spread corporate strategies to drive customer engagement, such as the usage of pervasive technology to build habits on users, are based on unmoral principles that invite critique, and perhaps, rejection. Finally, the limitations of the research suggest than additional validation is required, leaving several unresolved questions that could drive further scientific research.

Keywords: pro-environmental behavior, gamification, marketing, climate change public engagement, renewable energy crowdfunding platform.

Abstract (PT)

Para alcançar a transformação necessária em direção a uma sociedade de baixo carbono, é óbvio que todas as inovações tecnológicas que virão também devem ser acompanhadas por mudanças gigantescas nos padrões de estilo de vida. Este estudo tem como objetivo identificar uma possível estratégia de marketing gamificada que fomente o comportamento pró-ambiental para um aplicativo de crowdfunding de projetos de energia renovável. Além do crescente interesse da indústria pela gamificação, há poucas pesquisas sobre como implementar tais abordagens de forma a promover um comportamento pró-ambiental.

A pesquisa fornece uma revisão integrativa da literatura de assuntos como psicologia ambiental, gamificação e interação humano-computador, para finalmente delinear uma estrutura abrangente para orientar os profissionais na promoção de um comportamento sustentável no mundo dos negócios, no contexto de uma plataforma de crowdfunding de energia renovável, e também a análise de um caso de negócios, Seeds.

Embora muitos elementos do jogo e técnicas de marketing possam ser positivos para um maior engajamento do cliente e desenvolvimento de negócios, eles podem ser severamente contraproducentes como uma estratégia para o engajamento público da mudança climática e contrastam fortemente com as práticas sustentáveis de longo prazo que são necessárias para se transformar em um clima sociedade neutra. Este trabalho sugere que o ethos corporativo pode fazer mais mal do que bem quando se trata de combater as mudanças climáticas. Algumas estratégias corporativas amplamente difundidas para impulsionar o envolvimento do cliente, como o uso de tecnologia difundida para criar hábitos nos usuários, baseiam-se em princípios morais que convidam à crítica e, talvez, à rejeição. Finalmente, as limitações da pesquisa sugerem que uma validação adicional é necessária, deixando várias questões não resolvidas que podem conduzir a pesquisas científicas adicionais

Palavras-chave: comportamento pró-ambiental, gamificação, marketing, engajamento público sobre mudanças climáticas, plataforma de crowdfunding de energia renovável

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List of Acronyms

B2B: Business to Business

B2C: Business to Customer

CO2e: Carbon dioxide equivalent

DMC: Dynamics Mechanics Components

EU: European union

GHG: Greenhouse gases

HCI: Human Computer Interaction

RE: Renewable Energy

UN: United Nations

USD: US Dollar

1. Introduction:

To date, the energy transition has been underfunded. According to the International Renewable Energy Agency "In the power sector, the global energy transformation would require investment of nearly USD 22.5 trillion in new renewable installed capacity through 2050. This would imply at least a doubling of annual investments compared to the current levels, from almost USD 310 billion to over USD 660 billion (Fagan and Huang, 2020). In 2018, humanity was below 50% of the investment required to avert the worst consequences of climate change. This staggering statistic clearly shows that financial investment needs to either be redirected to the energy transition, or new financing channels need to be opened. Crowdfunding can play a pivotal role in changing the course of the energy transition. And that is what *Seeds Renewables* intends to do, believing that every regular citizen could play a big role in financing this transition. As a founder, this was always my main objective.

Seeds Renewables S.L. (hereby "*Seeds*") is an environmental Financial Technology (FinTech) mobile application that sits uniquely at the crossroads of Cleantech and the digitization of financial services by using crowdfunding to finance renewable energy projects. *Seeds'* goal is to create the digital platform which can harness the collective financial power of the environmental movement by lowering the financial barrier for investment to just spare change, by giving investors full control of which projects their investments build and by providing a competitive return on investment. By using crowdfunding to finance the construction of renewables, *Seeds* creates a virtuous cycle of financial growth for the public which helps incentivize, democratize and decentralize the energy transition. From the scratch, sounds like a tool that many environmentally concerned citizens would be interested in. And perhaps the biggest challenge that Seeds faces is to create a community of users big enough to finance the projects in time. Considering that users investments are conceived to be very low, in order to collect the amount of money required to finance a loan for a renewable energy project a high number of micro investments are required. To have a better idea, according to the latest financial models, the critical mass to finance projects at a steady pace, also the break-even point, is 63.000 users (*Seeds Renewables Business Plan*, 2021). Therefore, finding a marketing strategy that scales the userbase is a critical aspect for the success of the company. Additionally, the marketing strategy should procure not only to acquire users, but also to retain and engage them. According to Localytics, the average mobile app loses 80% of its users within just three days of download. Making the company's value clear from the beginning is also essential.

Seeds first marketing approach for customer engagement was to use game mechanics (achievements, badges and leaderboards) to engage the users and ensure customer retention. This strategy is known as gamification and consists in the application of game-thinking in non-game contexts. Borrowing the mechanics of traditional games and applying them to Seeds, basing the model in the book Hooked, was intended to increase customer retention and stimulate regular engagement. The Seeds "game" was based on motivating users to increase their positive environmental impact by tracking and offsetting their carbon emissions. The user's investments were translated into carbon offset equivalencies creating

the challenge of reaching carbon neutrality on a weekly basis or even pursuing to become climate positive. By calculating the avoided greenhouse emissions from the installation of renewable energy projects this could be translated into a reduction of their carbon emissions. Additionally, the investments were thought to be translated into metrics such as number of trees planted, cars and short haul flights avoided, or houses powered. This first approach was conceived during the time participating in the NYSERDA accelerator over the summer of 2021, and it was conceived as one of the unique selling propositions of the company.

However, as we will see in the next pages, if the end goal of Seeds is to help their users fight climate change, the gamification strategy that was proposed faces several limitations that invite critique, perhaps even rejection.

This study aims to investigate whether or not there is a possible gamified approach for a renewable energy project crowdfunding platform that fosters eco-friendly behavior. Combining insights from environmental psychology, gamification, human computer interaction, and behavioral economics, it will be hypothesized how gamification can be used as a way to engage people in pro-environmental behavior. The analysis of the literature will be synthetized into a theoretical framework, to later analyze the business case of Seeds. After doing a critical review of the first engagement strategy in the context of subjects mentioned before, a new approach for gamification will be presented, inspired by the previous theoretical framework and the 6D method, or *six Steps to Gamification* from Werbach and Hunter.

1.1. Description of the research area

The dissertation entails different research areas, as we can see below in figure 1. The research that has been conducted is based on a literature review that tried to find relevant collective evidence on some joint topics such as gamification and business practices, marketing and behavioral interventions, environmental psychology and human-computer interaction. The research process, despite being perhaps too fragmented and interdisciplinary, it is evidently conceived this way to have a practical application to the business case of Seeds, but is considered to be relevant for any other crowdfunding or investing platform within the renewable energy industry, or any platform that would like to foster pro-environmental behavior with a gamified implementation.
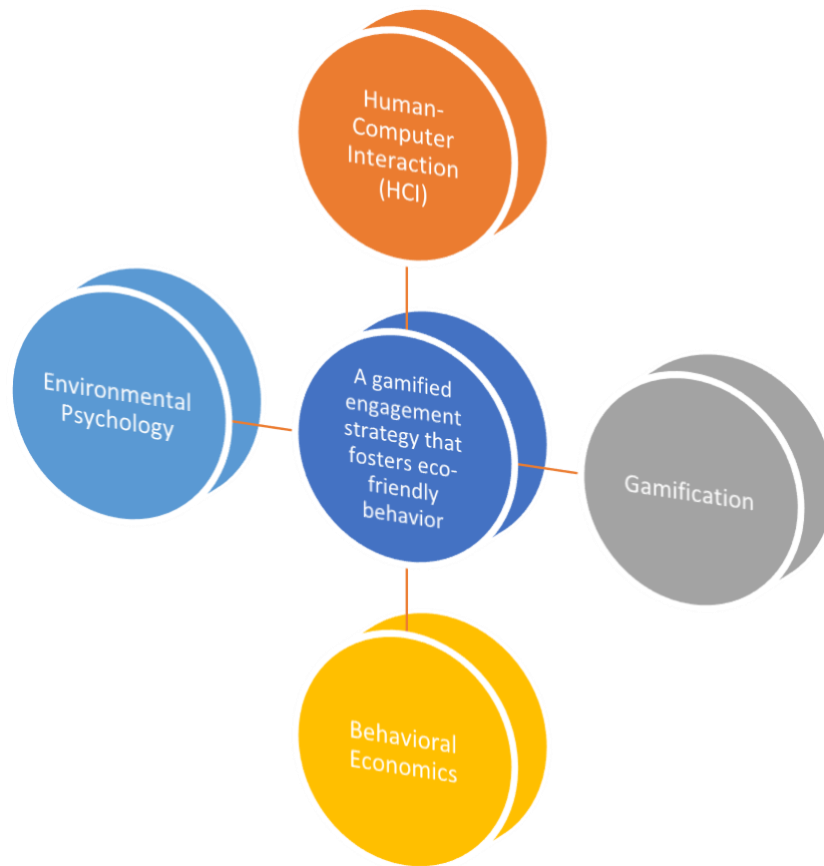
Figure 1: Research areas covered in the dissertation

1.2. Problem statement

The question that this study evaluates is: *Is it possible to foster pro-environmental behavior through a gamified app to invest in renewable energy projects? If it is, which are the critical success factors to implement this green gamification approach?*

1.3. Goal and relevance of the research

The goal of this dissertation is to present critical success factors for gamification and marketing approaches as a method to increased pro-environmental behavior and customer engagement and retention. Doing an analysis on the existing literature in behavioral science, environmental psychology, and other domains (represented in figure 1), the insights extracted will be summarized in a theoretical framework that will be used as a base to design a gamification strategy to foster pro-environmental behavior while building a strong relationship with customers.

Furthermore, the business case of Seeds will be analyzed, to apply all the findings of the theoretical part by analyzing their current gamification strategy, and proposing a new model. This model or design

concept can be used for Seeds, but also any other similar platform. In this sense, besides the highly contextual green gamification implementation proposal, the conclusions of the analysis can be interesting to any emerging platform willing to drive sustainable behavior to their users. Whether or not gamification approaches are used as a business strategy for customer engagement, several trade-offs might occur when using marketing-based approaches for behavioral interventions. The role and limitations that marketing and gamification plays in engaging the public in climate change is analyzed. Also, the role that visualization methodologies can play by providing ecological feedback to users is discussed, highlighting the limitations and opportunities than this area of research (eco-feedback technologies) can bring to companies that try to foster pro-environmental behavior.

This dissertation is relevant for the scientific and business world, for many reasons. Searching for tools and technology for growth and increased pro-environmental behavior is not only of significance to businesses but also to the environment. This study mainly concerns 4 of the United Nations Sustainable Development Goals (SDGs); Which are goal number 9: Industry, Innovation, and Infrastructure, goal number 11: Sustainable cities and communities and goal number, 12: Responsible Consumption and Production 13: Climate Action (The United Nations, 2020). The ambition of this study is to compile joint knowledge around different areas to try to find an effective method to make individuals act in a way that aligns with these goals. The findings of the study can be used for future studies within these domains. Also, due to the heterogeneous nature of the research, many knowledge gaps and understudied areas have been found.

1.4. Interest of the client

All the businesses interacting with consumers through technology can surely benefit from understanding the effect that gamification has on consumer acquisition and retention. But it is also of fundamental importance to understand the critical factors and limitations of gamification and marketing approaches, as well as understanding the different game mechanics features and how to evaluate them given a specific business context. Also, there are many reasons why sustainable user behavior should be of interest of marketers. In Ripple et al. (2017) words: marketers should be cognizant that the consumption mindset that conventional marketing promotes is a big driver of negative environmental impacts (Csikszentmihalyi 2000; Peattie and Peattie 2009).

Additionally, businesses able to adapt to the demands of our changing times, including the urgent demand for sustainability, will probably be more likely to succeed in a longer perspective while enjoying the strategic benefits (Banerjee, Iyer, and Kashyap 2003). Moreover, research suggests that socially and environmentally responsible business practices have the potential to harvest more positive consumer perceptions of the organization, and also increases in profitability (Brown and Dacin 1997; Luo and Bhattacharya 2006; Olsen, Slotegraaf, and Chandukala 2014; Sen and Bhattacharya 2001).

Ideally, the outcome presented in the last part of the dissertation can be used as a foundation for designers and programmers at Seeds if there was willingness to implement a pro-environmental

gamified marketing strategy in any future app, minimizing time and effort required to implement such approaches.

1.5. Thesis Structure

The structure of the text chronologically follows the methodological steps taken when conducting the research. A summary of the most important content of each chapter is given here.

All the theory will be explained in the chapter hereafter, chapter two. First, it provides a definition of all the important concepts that will be extended during the rest of the dissertation. Then, an integrative literature review is conducted going through the following topics: behavioral interventions, psychological barriers to adopt sustainable practices, carbon offsets limitations, marketing-based approaches for climate change public engagement limitations, gamification and finally visualization of the ecological footprint. More details on the logics of the research process will be found in the next chapter.

The details with regards to the used research methods, theories and frameworks will be explained in chapter 3, Methodology. Then, a broad synthesis of the literature review is conducted and developed in chapter 4. This integrated theoretical framework is a way of summarizing all the findings from chapter 2 in a way they can be applied in a more straight-forward manner in the next chapter.

In chapter 5, a business case study is conducted, analyzing the first gamification strategy of Seeds, and later proposing a promising and innovative gamification approach, aligned with all the previous research conducted. The most important conclusions and contributions of work are summarized in the chapter 6. The final chapter describes the limitations and suggestions for future work.

2. Literature review

The aim in the beginning of the literature review is to share first, the logic that has been followed to extract insights from the literature. Once the research process has been clarified, the research areas will be mapped out. Then some basic definitions on the different topics will be provided, to be followed up with more in-depth discussions.

2.1. Research rationale

Here, the research question "*Is it possible to foster pro-environmental behavior through a gamified app to invest in renewable energy projects? If it is, which are the critical success factors to implement this green gamification approach?*" is broken down into sub questions. This can be seen in the figure 2, which shows the logic process of the research.
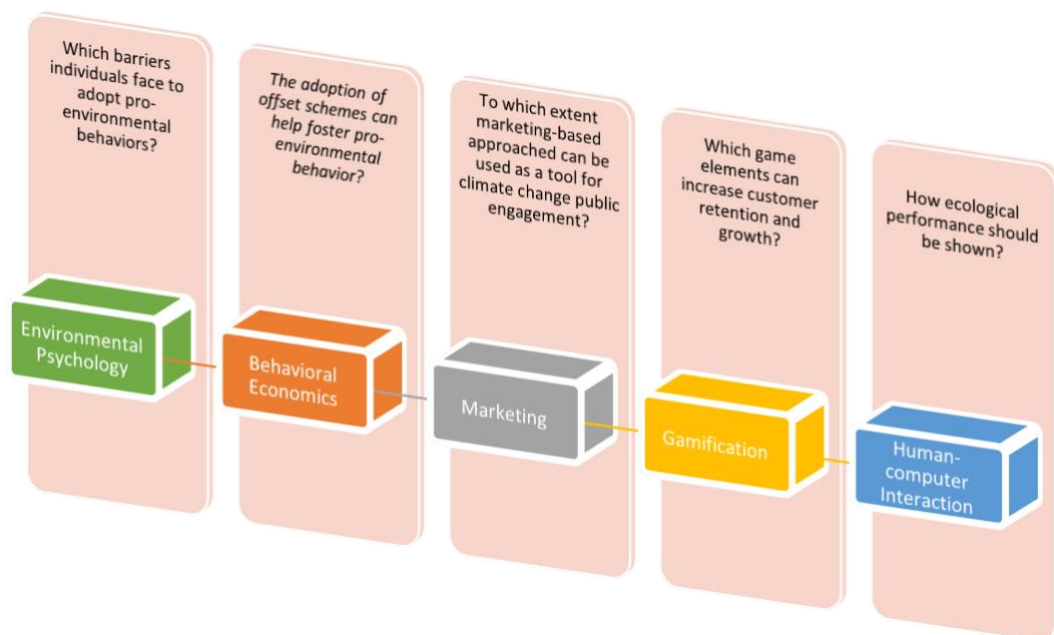
Figure 2: Research Rationale

To understand how to sustainable practices could be promoted, the first area that was addressed was environmental psychology. Starting with the question *"Which barriers individuals face to adopt pro-environmental behaviors?"*

This leads to the analysis of behavior interventions in an ecological context, with a broad analysis of the barriers that hinder pro-environmental behavior. This will conclude with an analysis of the ones that are relevant in the current research, which is to say, in the context of a gamified app to invest in renewable

energy projects. The conclusion will particularly stress the importance of analyzing a well-known psychological phenomenon, paying to alleviate guilt. This issue is far from new, and is now being put in practice in the voluntary carbon market, driving a profound debate among the scientific community. To approach the question "*The adoption of offset schemes can help foster pro-environmental behavior?*" it was deemed necessary to understand first the limitations that such approaches face, by carefully examining them through the lens of behavioral economics.

Following this, an analysis on marketing-based approaches for climate change public engagement is conducted. To know to which extent these approaches can help foster pro-environmental behavior, a broad revision on marketing interventions in this context was conducted. This part specifically tries to address the question "*to which extent marketing-based approached can be used as a tool for climate change public engagement?*"

The discussion follows with an analysis on gamification practices, trying to answer the question "*Which game elements can increase customer retention and growth?*"

Lastly, having into account that the design and investigation of technologies that provide ecological feedback received considerable scientific attention in the last few decades as a way of helping individuals reduce their environmental impact (Houwelingen & Raaij, 1989; Hutton, Mauser, Filiatrault, & Ahtola, 1986; Kappel & Grechenig, 2009; Kuznetsov & Paulos, 2010; Matsukawa, 2004; Seligman & Darley, 1977; Winett & Kagel, 1984), it was considered relevant to pass through this area to enrich the research, by addressing the question *"How ecological performance should be shown?"*

2.2. Concepts of the research background

To provide some basic insights on the different topics that are discussed in the following pages, some definitions on the different basic concepts are provided. Below in figure 3 we can see a concept map that groups all the concepts that are introduced in this section by their different research areas. Note that the area "marketing" has not been considered as no concept has been introduced within that area.
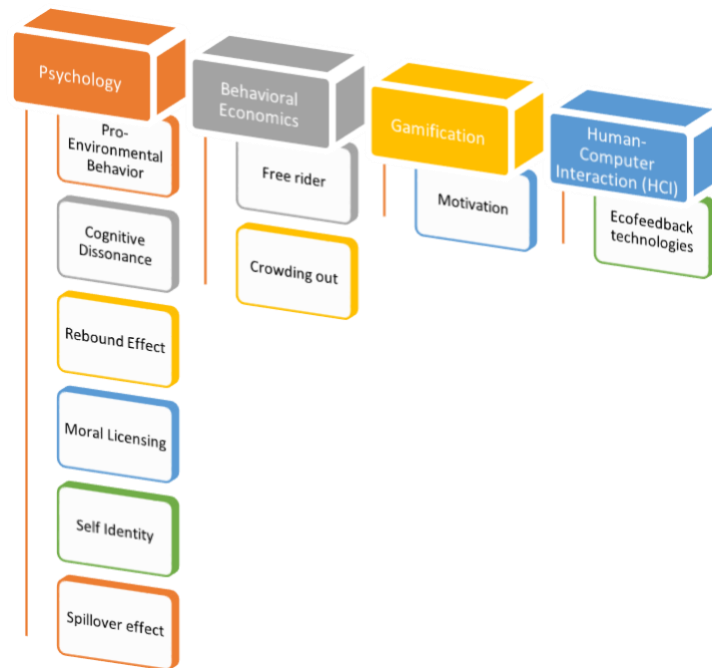
Figure 3: Concept topic map

2.2.1. Psychology

2.2.1.1. Pro-Environmental Behavior

Pro-environmental behavior, also known as green-, sustainable-, or environmentally-friendly (eco-friendly) behavior, is defined as behaviors in which individuals take protective actions toward the environment (Krajhanzl et al., 2010).

2.2.1.2. Cognitive Dissonance

Cognitive dissonance refers to a situation involving conflicting attitudes, beliefs or behaviors. This produces a feeling of mental discomfort leading to an alteration in one of the attitudes, beliefs or behaviors to reduce the discomfort and restore balance.

2.2.1.3. Rebound Effect

Rebound effects occur when an individual's actual savings in energy use, emissions, or other environmental impacts are lower than the potential savings, because they are partially or fully offset by negative behavioral responses (Sorrell, 2007; Guerra and Sancho, 2010; Chitnis et al., 2013; Thomas and Azevedo 2013a, 2013b; Santarius and Soland, 2018). In extreme cases, behavioral responses can even overcompensate the potential savings. Such phenomenon is called backfire effect (Santarius et al., 2016).

2.2.1.4. Moral licensing:

As Merritt et al. (2010, p. 344) describes, moral licensing phenomenon occurs when "past good deeds liberate individuals to engage in behaviors that are immoral, unethical, or problematic, behaviors that they would otherwise avoid for fear to appear immoral." In the context of pro-environmental behavior, moral licensing can bring about negative spillover effects, i.e. the initial performance of a pro-environmental behavior reduces the probability of other subsequent pro-environmental behaviors (Nilsson et al., 2017). As the changes in subsequent behaviors may imply increases in the GHG emissions, the moral licensing theory can potentially explain rebound effects on the individual level.

2.2.1.5. Self-Identity:

Self-identity refers to a person's sense of self. It is generally understood as a label that people use to describe themselves (e.g., "I am an environmentalist"; Whitmarsh & O'Neill, 2010) reflecting a particular self-definition (see Gollwitzer, Wicklund, & Hilton, 1982). With regard to pro-environmental action, past research has shown that the more one self-identifies as an environmentalist, the higher one's intention to act in a green manner in the future, and the greener one's actual behavior.

2.2.1.6. Spillover effect:

The spillover effect proposes that engaging in one behavior affects the probability of engagement (positive spillover) or disengaging (negative spillover) in a second behavior. Positive spillover is more likely whenever a difficult pro-environmental behavior has been completed and the second one is similar in terms of effort. Negative spillover is more likely to occur whenever the first pro-environmental behavior is easy, and the following one is similar. Below, in figure 4, this concept is schematized.
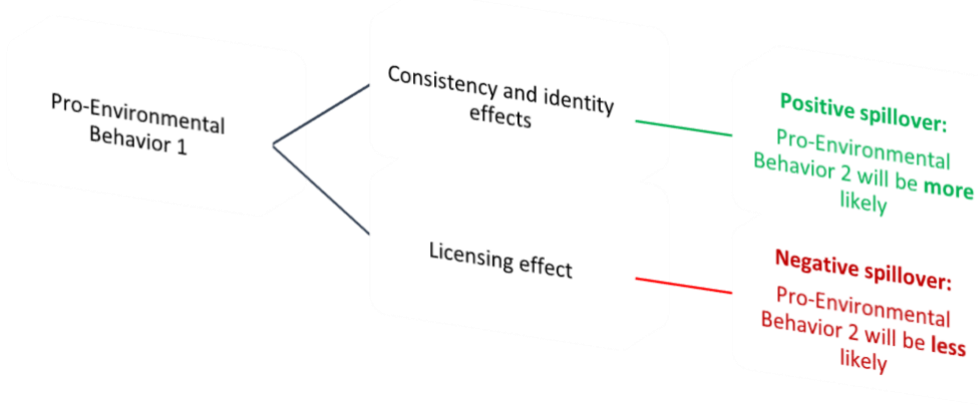
Figure 4: Spillover Effect

2.2.2. Behavioral Economics

2.2.2.1. Free-rider problem

The Free Rider Effect is a situation where an individual or organization is able to benefit from the actions of another without contributing to the cost associated with such actions (Baumol, 1952)

2.2.2.2. Crowding Out

Behavioral economists and other social scientists use "crowding out" to describe a downside of solutions based on private exchange: the crowding out of intrinsic motivation and prosocial norms in response to the financial incentives of voluntary market exchange (Titmuss, 1970).

2.2.3. Human Computer Interaction

One of the main areas of this research is Human-Computer Interaction (HCI). HCI involves the planning, design, and studies of computer technologies and, in particular, the interaction between users and computers (Finlay et. al, 2003).

2.2.3.1. Eco-Feedback Technologies

Eco-Feedback technology provides feedback on individual or group behaviors with a goal of reducing environmental impact. For example, they can provide occupants with useful information about their past and current energy usage patterns with different levels of temporal granularity (e.g. hourly consumption of lighting) (Zhou et. al, 2017).

2.2.4. Gamification

The use of game elements in non-gaming systems, also known by gamification, is a topic that received decent research attention in the last decades. Found in the crossroad of two well-researched areas: motivation and game playing, Gamification attempts to harness the motivational power of games in order to foster individuals participation, persistence and achievements.

2.2.4.1. Motivation

The word motivation has its origin in the Latin word motives, which means "serving to move". To be motivated is to be moved to do something. It is possible to differentiate two universal kinds of motivation. Wanting to do something is called intrinsic motivation because, for the person involved, the motivation lies inside the activity. On the other hand, feeling that you need to do something involves extrinsic motivation, because the motivation lies outside (Hunter and Werbach, 2012). Many pro-environmental activities are commonly linked to extrinsic motivation and not intrinsic motivation. For example, most people recycle because it has to be done, and not because it is particularly enjoyable or fun. In the context of this research, we will understand the trade-offs among the two, in order to understand which mechanisms can be used effectively.

2.3. Behavioral interventions in the context of climate change:

Many environmental problems, including air pollution, waste problems, littering and climate change are of anthropogenic nature (Solomon et al, 2007). To find a way countering these problems, behavioral interventions are indispensable. In order to gain understanding which mechanisms and barriers are found when trying to foster climate friendly behavior in the context of the current research, the first step will be to dive in the areas of behavioral science and environmental psychology.

2.3.1. A brief introduction to Environmental Psychology

Environmental psychology, as a distinct and recognized area of psychology, is relatively recent. It was developed in the US in the 1960s, indicating wide range of intricate interactions between humans and the environment. What was concluded from the researching in this area is that understanding better how to achieve radical emissions reduction through behavior and lifestyle patterns shift is an incredibly complex task, and so far there is no clue on any definitive explanation or theory of how and why people become environmentally responsible (Froehlich, Findlater and Landay 2010).

Despite of this, many theoretical frameworks have been developed to analyse the connection and gap between environmental attitude and pro environmental behaviour, but no concrete answer has been found. Early models of environmental research, beginning in 1970's showed some type of linear relationship between attitude and behaviour and positive attitude leads to positive behaviour. Beyond environmental education literature, investigation into the nature of relationship between attitude and behaviour date back to 1930s, research such as (La Piere's, 1934) found that attitudes were irrelevant to prediction of behaviour. The fact that whether attitude is a predictor of pro environmental behaviour continues to be the focus of much academic and commercial research, although it is only one of the factors affecting pro-environmental behaviour. In conclusion, little is known on which conditions can predict pro-environmental behavior, and perhaps what is better known is the barriers that many individuals face to adopt pro-environmental behaviors (Gifford, 2011).

2.3.2. Psychological barriers: the Dragons of inaction

To understand better what limits more widespread pro-environmental actions on the part of individuals for whom such actions are feasible, the psychological model of the "Dragons of inaction" that Gifford et. al (2011) developed is reviewed. This model tries to approach the mystery surrounding the mismatch between attitude ("I agree this is the best course of action") and behavior ("but I am not doing it") with regards to environmental problems. It is based on seven general psychological barriers as potential influences that limit adopting pro-environmental practices, and some of the barriers proposed are recognized in one psychological research domain or another, being extensively researched (in other domains) much more than others. These barriers have not been considered as a group, although a few

social scientists have discussed some of them (e.g., Gifford, 2008; Kollmuss & Agyeman, 2002; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). A general overview and definition of these psychological obstacles to adopt pro-environmental behaviors is represented in the table 1. The ones who are believed to be more relevant to the case study will be discussed afterwards.

Table 1: Psychological Barriers (adapted from Gifford, Robert. (2011). The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation)

General psychological barrier	Specific manifestation	Definition	Relevant to the case study
Limited cognition	Ancient Brain	Our brains have not evolved much since the time when we were no threat to the environment as a whole. Therefore, we tend to think in terms of immediately providing for ourselves, our families, and our friends, rather than the more distant or future task of sustaining the complex environmental systems upon which we ultimately depend.	
	Ignorance	Some people are still unaware that climate change is a problem. Others are quite aware, but have no knowledge of what to do about it. This may be caused by mixed media messages, lack of individual research, or perhaps simply a lack of technical knowledge about what is and is not effective.	Any approach directed to inform and educate can help overcoming this obstacle.
	Environmental Numbness	This manifests in two ways. First, it can mean screening out the distant aspects of climate change with which one cannot immediately identify or which have no immediate impact. Many citizens perceive climate change as a phenomenon outside their immediate attention because it is not causing any immediate personal difficulties. Second, when we receive very frequent messages about climate change or the environment, we habituate to the message rather than actively listening to it. It has been demonstrated that when viewers have seen the same advertisement many times, attention to it shrinks as habituation increases (Belch, 1982; Burke & Edell, 1986).	Numbness can be tackled by providing information that connect with the immediate context of people, and also it's not identified as "the same old message".
	Uncertainty	When we are not sure, we hesitate; hesitation is inaction. Uncertainty can also feed self-interest: not sure how much of a resource is available? We tend to assume there are lots of it	
	Judgemental discounting	Spatial discounting: Occurs when individuals presume that climate change or environmental problems are worse in other places than their own, so that they need not take personal responsibility now. Temporal discounting: Occurs when individuals presume that climate change or environmental problems will occur so far in the future that they need not take personal responsibility now.	This also goes in line of providing relevant contextual information to individuals. Communicating the present effects of climate change in the location individuals are placed can help reduce discounting.

	Optimism bias	Usually, optimism is a good thing, but many individuals assume they are less at risk for health issues than they actually are, and in terms of environmental problems, they often assume that all will be well without they themselves needing to act.	
	Perceived behavioral control / self-efficacy	Because climate change is a global problem, many individuals believe they can do nothing about it as individuals. This is the well-known collective action problem (Olson, 1965). Stated in psychological language, people sometimes do not act because they perceive that they have little behavioral control over the outcome (e.g., Ajzen, 1991; Huebner & Lipsey, 1981) or that they their actions will not have much impact (a lack of self-efficacy; Ajzen, 2002)	Past research has found self-efficacy to be a positive predictor of environmental behavior (Lee et al., 2014, Tabernero and Hernández, 2011). This study will assess the role that giving ecological feedback cacn have in increasing or decreasing the feelings of self-efficacy.
Ideologies	Worldviews	For example, strong belief in free-enterprise capitalism tends to include the belief that the natural world is free to exploit as much as one desire or is able	This barrier is identified to be one of the underlying principles of the carbon offsetting mechanisms.
	Suprahuman powers	Some people believe that an omnipotent deity will cause or solve environmental problems. Others believe that Mother Nature is in charge. In both cases, the believer does not feel responsible for the climate or the environment.	
	Technosalvation	This is the belief that technology, such as geoengineering, can, by itself, reverse the effects of climate change. Although this field may have some promise, overconfidence in it can lead to inaction.	
	System Justification	People whose lifestyle is comfortable but climate-negative often would not like to lose that comfort. One way they justify keeping their lifestyle intact is by believing that "this is the way it was meant to be."	
Comparison with others	Social comparison	People often compare their actions with those of others to determine the "correct" behavior, even when that behavior is harmful for the environment	Social comparisons and norms are believed to be one of the best motivators to behave pro-environmentally in a gamified context. How to take advantage of these dragons is further elaborated in the following sections,
	Social norms and networks	Norms predict behaviour. For example, when homeowners are told the average electricity use on their block, they tend to alter their own usage to match it, whether that's up or down!	
	Perceived inequity	No one wants to be taken advantage of. When people believe that others will not take steps to reduce their use of carbon or help the environment, they are less likely to do so themselves.	
	Authority rules	Sometimes one's boss or organization requires one to travel or engage in other carbon-negative behavior.	
Sunk Costs	Financial investments	If someone invests in a car, for instance, she or he is then less likely to bicycle for environmental reasons. This monetary choice scales all the way to up to making important investments in fossil fuel stocks	

	Behavioral momentum	Habit may not be a glamorous barrier, but it may be one of the most important for the mitigation of climate change impacts (e.g., Hobson, 2003) because many habitual behaviors are extremely resistant to permanent change, and many of our habits are not climate-positive. For example, eating habits and transportation habits can have strong negative effects on the climate and environment.	Without going very deeply into the matter, the role that habits play with regards to environmental protection will be discussed. Also a critique on how by means of persuasive technology some companies mastered the creation of habit-forming products in order to maximize their revenue.
	Conflicting values, goals and aspirations	This is an especially difficult dragon. We all have multiple goals, often quite worthy in themselves, and those other goals and aspirations often conflict with the goal of not harming the environment.	
	Lack of place attachment	Those who love the place in which they live are more likely to take care of it. Conversely, those with less attachment to the place where they live are also less likely to act in pro-environmental ways	
Discredence	Mistrust	Trust is essential for healthy relationships. When it is absent, as it sometimes is between citizens and their scientists or government officials, resistance in one form or another follows. This distrust leads to inaction.	
	Perceived program inadequacy	Even if individuals do trust authorities, they may not trust the programs that policymakers have proposed or implemented. Because most such programs are voluntary, some people blame the program's shortcomings, rather than their own non-compliance, for their unwillingness to take part.	
	Denial	Although this is becoming less common, the outright denial of climate and environmental problems can still be found. Deniers seem to be over-represented in the comments sections of the media.	
	Reactance	Some people not only distrust authorities, but actively take steps to engage in even more actions that harm the environment.	
	Contrarian personality	Some people have a generalized tendency to disbelieve conventional wisdom. Such a person might believe that climate change is another hoax	
Perceived Risk	Functional	What if the change I am considering will not work as well as my current choice does? For example, one may not consider an electric vehicle out of fear that battery problems might limit its range.	
	Physical	For example, someone might consider cycling more, but worry about accidents.	
	Financial	Some environmental changes, such as solar panels, require significant initial costs. Will the investment pay off before one moves to a another residence?	
	Social	What if a person's friends tease her for choosing a pro-environmental action, or at least she fears that they will? This slows change	

	Psychological	When teasing becomes more serious, such as from a significant other, or from a larger number of others, it can cause more serious psychological damage.	
	Temporal	Time is valuable. One might decide not to change merely because the time needed to research the change means that the time spent is not spent on something else. What if the time spent leads to a change that is subject to one of the above risks? Hesitation hinders change.	
Limited behavior	Rebound effect	Possibly the most ironic of the dragons of inaction, the rebound effect occurs when a positive environmental behavior is followed by one that negates it. For instance, people with fuel-efficient vehicles sometimes drive more than those without them, to the point where the net damage is greater. This is also called the Jevons Paradox or the Khazzoom-Brookes postulate.	This rebound effect will be discussed extensively, as it is believed to be the most dangerous obstacle in the current research context.
	Tokenism	The climate change behaviors that are easiest to implement tend to have the least effect on the reduction of greenhouse gasses, so some people choose less effective solutions than they could.	

2.3.3. Paying to alleviate guilt, a familiar story

Allowing people to fund projects that allegedly reduce their greenhouse gas emissions is not necessarily a bad idea. However, as the following lines suggest, depending how the concept is framed, it can end up with no real reduction on individuals emissions – or in the worst-case scenario, even increasing them. This phenomenon, called rebound effect or Jevons Paradox, occurs when a positive environmental behavior is displaced by another one that negates it. To better understand this concept, consider the example of people that have fuel-efficient vehicles. They often drive more than those without them, in many cases reaching a point where the net damage is greater.

There has been a rapid increase in start-ups which allow individuals to offset their emissions by selling them carbon credits emitted by projects targeted at reducing GHG from the atmosphere. Below in figures 5 and 6, we can see a few examples on how they market their services. As the current research highlights, there is little scientific research on how the carbon offsets might increase consumers' emissions, but there is significant evidence in other research areas showing that those offset schemes are not likely represent a solution to help individuals reduce their emissions. For example, Uri Gneezy of the University of California, and Aldo Rustichini of the University of Minnesota experimented with offsets by charging parents a small fee whenever they arrived late to pick up their children. The result was that, instead of decreasing, the number of late pickups increased considerably (more than doubling). The ability to pay a fee, which is at the end an offset, alleviated guilt and justified delays.

Figure 5: Offsetting platform example (Offsetra)
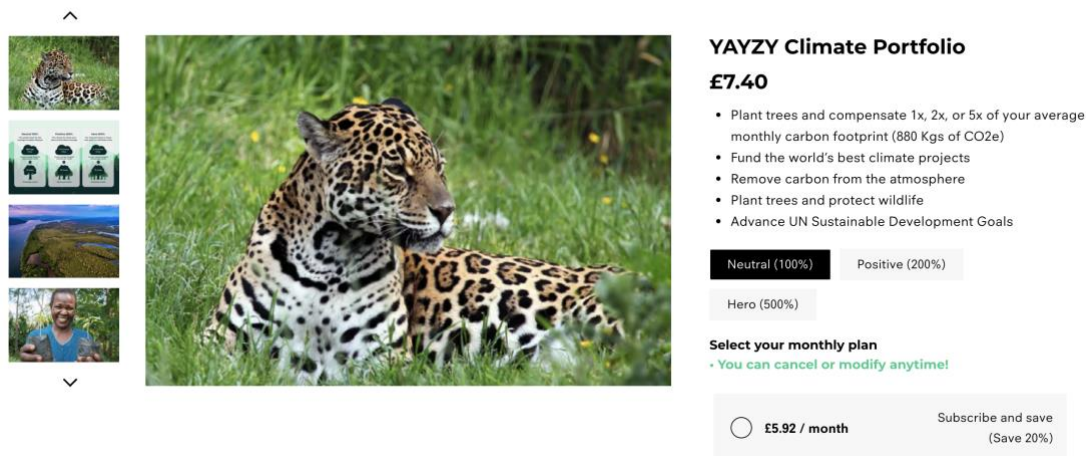
Figure 6: Offsetting platform example (YAYZY)

Similarly, offsetting platforms might allow their users to buy a way out of eco-guilt, the offset market may actually lead people to emit even more greenhouse gases, perhaps by encouraging them to take one flight to an exotic destination or continuing using their cars on daily basis.

To understand to which extend the offsetting markets can be an effective way to frame the investments in renewable energy projects, if the end goal is to foster pro-environmental behavior.

2.4. A syncretic analysis of Carbon Offsets

Many commentators have questioned if the carbon offsets can represent a real solution to climate change, arguing that carbon offsets can be a perfect excuse to continue with business as usual with regard to pollution. Some activists even compare them with the indulgences that were used to be sold to allow Catholics to buy forgiveness for their sins (Monbiot, 2006). But does this analogy make sense?

2.4.1. History

In the wake of a growing economic and environmental crises, some neoliberal conservation strategies centered on promotion of market-based instruments has arisen (Heyden and Robbins, 2005; Büscher and Fletcher, 2014; McAfee 1999). Some examples on these market instruments are bioprospecting, ecotourism, biodiversity and carbon offsetting, wetlands banking, and also PES (Payment for Ecosystem Services) and REDD+ (Reducing Emissions from Deforestation and forest Degradation). While they vary widely, they tend to share a common logic, which is harnessing economic markets as a means to attach sufficient monetary value to biodiversity (often referred in their narrative as "nature capital") to cover the opportunity costs of alternative land use and thereby incentivize conservation and protection over other land use, such as resources extraction. These mechanisms originally intended to reconcile economic development and environmental protection, by harnessing conservation as a form of income generation. However, as this section suggests, these mechanisms have failed to promote environmental justice, and have been widely questioned by conservationists. Their arguments against marketisation of nature are that it can alleviate shareholder concerns and simplify the debate about development. Using this market logics, a petrol company can use offsetting to push a destructive project over the line, in which without offsets there would be stronger grounds to put it down. In other terms, monetization of environmental damage eliminates intrinsic motivation to behave environmentally friendly.

In the compliance carbon markets, we have seen what can go wrong when corporations, that have few interests in ecology, are invited into policy. The UN Clean Development Mechanism, established under the Kyoto protocol, allowed industrialized countries to meet some of their obligations by funding carbon-reducing projects in the developing world. Countries committed to establishing a mechanism for exchanging carbon credits under the 2015 Paris climate accord but there has been no agreement on how to implement it. There are 64 different carbon pricing initiatives planned or in place globally — between them they cover just 22 per cent of greenhouse gas emissions (The World Bank, 2020). In order that the carbon markets pose a real solution, a meaningful global carbon price is required. The closest so far to reach this point is the EU's Emissions Trading System, which is the world's largest carbon market. However, while its prices have risen, they are still too low to drive emissions down at the scale and pace required. In addition, the pressure of corporations and the open secret of corruption in these global organizations have undermined the credibility of all these mechanisms, also challenging the credit of any future market-based solution. Polluting industries lobbied politicians and overstated their previous emissions to obtain more carbon credits. This has kept the carbon price far too low (at roughly US\$10/tCO2e4) (World Bank, 2019:10) to provide incentives to decarbonize economies. Governments also individually offset prices by reducing taxes or provide free permits to polluting industries (Grubb, Azar and Persson, 2005). In this way, there is substantial evidence that shows no reduction or avoidance of emissions due to markets so far (Chomitz, 2006; Lohmann 2005; Böhm and Dahbi, 2009; Spash, 2010). In the other hand, the voluntary carbon offsets market, which is not regulated by any international or global entity, has grown substantially during this last year. While compliance

carbon markets already lost all the credibility, the voluntary carbon market has the opportunity to learn from the past and avoid becoming corrupt.

2.4.2. Voluntary Carbon Market and its limitations

Even if there is an increasingly number of people and corporations who are investing big amounts of time and money in this market, still the scale of their efforts is completely symbolical. Nowadays, the voluntary market it's about a hundredth the size of the compliance market, that was already far away from having the scale required to strive real change. From an economy viewpoint, offsets work like charitable contributions to a public good. And a basic principle in economics is that voluntary contributions never provide enough public goods (Baumol, 1952).

Public goods can be defined by two characteristics: non-excludability and non-rivalry. (Rittenberg and Tregarthen, 2013). Non-excludability means that no individual can prevent another from enjoying the good once it is offered. Non-rivalry means that one person's use of the good does not diminish other people's ability to enjoy it. Reducing greenhouse emissions from the atmosphere is a public good, as once the quality of air is improved, everyone can enjoy the benefits without adversely affecting others ability to do the same. The problem derived from this is that individuals and institutions fall prey to the free rider problem. If any citizen is able to enjoy the benefits of the good without providing it themselves, they might have a low incentive to contribute to the provisioning of that good. Additionally, the free rider problem is even worse when each contribution to the good represents only a trivial impact, as in the case of individual reductions of greenhouse gas emissions from the atmosphere. Anybody might ask themselves, "Why should I pay more to offset my emissions if it isn't even going to make a difference?" The result of this way of reasoning could be categorized as market failure. It has been shown in social sciences that despite evidence that people are prone to be cooperative by nature, whenever there is presence of free-riders prosocial behavior deteriorate, perpetuating the free-rider problem (Choi and Robertson, 2019).

Companies like Google, or BP recently announced they would be carbon-free by 2030, but said that until it could reach that goal, they would offset the emissions it cannot eliminate in the voluntary carbon offset market. This recent wave of companies voluntarily opting to offset their emissions have breathed fresh life into the carbon offset market over the past year (Voluntary Carbon and the Post-Pandemic recovery, 2020), but this market still has a huge price disparity and is still small and fragmented (Carbon Offsets Pricing Data, 2020), and more importantly, it is not transparent enough to prove it can be effective, and that, besides any economic indicator, is the first difficulty that needs to be overcome before scaling it. Many studies show that a big proportion of projects miscalculate their carbon savings. The German environmental research institute Öko-Institut has shown that the effectiveness of existing offsetting projects for the European Commission is incredibly low; concluding that only 2% of the projects have a high probability of resulting in additional emissions reduction (Cames, Harthan et. al, 2016).

Another insight from economics against the offsets logics is that payments could generate a perverse effect known as "crowd-out". Based on the theory that any externally driven economic incentive to achieve an outcome will erode autonomy, and therefore decrease intrinsic motivations. If there was any moral, aesthetic or care motivation for nature in relation to conservation, conditioning it to payments might be highly counterproductive (Kosoy and Corbera, 2010; Gordon et. al, 2015).

Intrinsic motivations have been proved to be very stable over time, and to be more robust to any extrinsic financial incentive. Expanding this aspect, if we have a look on the study by Narloch et al we can conclude that in communities where there is a greater institutional commitment to conservation, market-based approaches might foster a crowd-out situation, but may trigger a "crowd-in" situation where institutional ties are weak and motivations for conservation are few. However, according to Rode et al., there is much more evidence on the crowd-out phenomenon. Therefore, before contextualizing any project as a carbon offset, the motivations and the socioecological context should be assessed (Narloch et. al, 2012; Rode et. al, 2015).

2.4.3. Criticism of offsets

Most of the offsetting projects are located in the Global South and there are numerous evidences that show that they led to local conflicts or land grabbing. This is especially the case of many forest-based projects like REDD+ (Reducing Emissions from Deforestation and forest Degradation). Often, small landholders and indigenous local people are forbidden to inhabit the land in their ancestral way in order to store the predicted amounts of carbon in the trees, sometimes ending up with the ironic situation in which many of the planted trees are not necessarily beneficial to the local environment but only more productive in terms of carbon capture. When a forest is reduced exclusively to its carbon capture potential, it might end up being replaced with another commercial plantation to store a higher value of carbon, but resulting in a lower value of watershed protection or habitat provision, for example (Grandia, 2007). Projects focusing on monoculture end up damaging biodiverse ecosystems, therefore all regeneration projects should be well analyzed and framed, and economical incentives can end up separating nature from its ecological context, their socio-ecological relations and their different value conceptions. The valorisation of nature in purely economic ways has proven to be problematic as it denies nature as a system of co-dependent elements (Spash, 2010).

Also, tree planting projects have faced a lot of criticism in the past, because maintaining ecological balance requires a continuous effort, and some projects have been proven to be poorly designed and ended up with most of their trees dead shortly after they were planted. When trees are destroyed, as it could happen with a fire, all the accumulated carbon goes back into the atmosphere as CO_2 and other harmful gases. Carbon dioxide lingers in the atmosphere for approximately 100 years. This is important to understand how sensitive are forestry offsets are; they only work if the trees remain intact along a century.

Ultimately, offsetting is a type of carbon colonialism. To enable a small share of the world population to continue having an unsustainable way of life indefinitely with a clear environmental conscience, others bear the costs: people whose emissions are very often already very low, whose historical contribution to climate change is negligible, and who are already experiencing the higher impacts of the climate crisis with natural catastrophes.

If carbon markets can really pose a real solution to decarbonize our economy is still unknown, not only because of the outlined market limitations itself, but also because their use should be as a means of last resort. The inability to verify if corporations had done everything it was in their power to reduce their emissions before going to carbon offset market, makes it a double-edged sword. Misusing carbon offsets would simply be a sophisticated form of greenwashing, with corporations outsourcing most of their emissions reductions rather than changing their internal functioning. For a company is way easier to buy carbon credits than changing their whole supply chain functioning.

So far, the carbon markets failed to deliver environmental justice or target the most polluting industries (Finley-Brook, 2017). Same can happen with individuals; before using the offsets all the efforts should be dedicated to reduce oneself emissions. Therefore, what can be concluded from this part is, if the utmost objective of Seeds is to help people reduce their emissions, investments should never be framed as "offsets". Even if the voluntary carbon offset market has grown significantly in recent years and is expected to keep expanding, it is suggested that it won't make real progress on solving the problem of climate change, having into account all their current limitations. As it has been argued in the previous lines, the voluntary offsets work like the provision of public goods, and therefore, the incentive for free riding is quite strong. However, free riding is overcome partially by people who purchase offsets to obtain private benefits— as it is suggested here, guilt alleviation.

To summarize, what literature suggests is that reinforcing the competitive attractiveness of offsetting over true behavioral changes, by taking the advantage on the low psychological and economic involvement it requires from individuals it is not the best practice to foster pro-environmental behavior. Perhaps buying carbon offsets is better than doing nothing, but yet when considering ways to help individuals reduce their carbon footprint, the main motivator should be "Reduce what you can, offset what you can't."

2.5. The limits of marketing as a strategy for climate change public engagement

In this part we are going to analyze the role that marketing can play in building support for the more ambitious behavioral interventions that constitute a proportional response to climate change.

2.5.1. Segmentation limitations

When a behavior change campaign is planned, the first step is to understand the audience. This normally implies conducting a survey, to later segment the intended audience into different groups depending on their attitudes or behavior. This process is called "segmentation", and according to this analysis it has different limitations. As Peattie and Peattie (2009) suggested, when behavior is analyzed, the changes that any campaign can represent have measurable environmental benefits. But it's always tricky to measure the efficacy of a campaign as a whole: what if the most effective way of promoting pro-environmental behaviour 'A' was to pursue a strategy that was averse to the achievement of long term pro-environmental strategy 'Z'? Marketing interventions for behavior change are unable to resolve this conflict of interest – they are always limited to maximize the success of the immediate behavioral intervention. Behavior change campaigns always start with an analysis of the preferences and attitudes of their audience.

However, despite appearing to be a good idea at first instance, when tailoring a message to an audience's existing values, beliefs, and preferences there are some obvious restrictions. Namely, if the audience's way of thinking is opposed in some way to the goal of the campaign, then there will be important constrains on how much of the intended message can be included without being completely subverted to match the target audience way of thinking. At one time or another, the planner of the campaign would need to confront the possible conflict between the beliefs of the audience and the ultimate goal of the campaign. There is empirical evidence demonstrating that the inherent logics of marketing may be reinforcing values that have been demonstrated to make the performance of pro-environmental behavior (especially in a long term period, and across different domains) less rather than more likely (Crompton and Kasser, 2009).

To gain insight into the issue, the Schwartz' Theory of Basic Values can help us understand what a value is. According to the existing literature, a value is commonly defined as a 'guiding principle in the life of a person' (Schwartz, 1992). Significant efforts have been made to understand the different values that people hold and to identify certain sets of beliefs that tend to go together (Douglas and Wildavsky, 1982; Schwartz, 1992). The theory of Basic Values, represented below in table 2, lays out a series of 10 basic values, arranged in a circular structure to better understand how these values can be related or opposed. Schwartz extensive research has proved through the use of two different testing methods, that these values are universally common, but yet recognizing that the relative importance for an individual can be very different from person to person.

Table 2: Schwartz' Theory of Basic Values (adapted from Schwartz, S. H. 1992)

Value Type	Defining goal
Self-Direction	Independent thought and action–choosing, creating, exploring.
Stimulation	Excitement, novelty, and challenge in life.
Hedonism	Pleasure or sensuous gratification for oneself
Achievement	Personal success through demonstrating competence according to social standards.
Power	Social status and prestige, control or dominance over people and resources.
Security	Safety, harmony, and stability of society, of relationships, and of self.
Conformity	Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.
Tradition	Respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides.
Benevolence	Preserving and enhancing the welfare of those with whom one is in frequent personal contact (the 'in-group').
Universalism	Understanding, appreciation, tolerance, and protection for the welfare of all people and nature.

Based on extensive empirical research in over 60 nations (Schwartz and Bilsky, 1987; Schwartz et al., 2001), it is now widely accepted that there are certain values that tend to be opposed to each other, and could be considered as antagonistic. This can be seen below in figure 7. In particular, individuals who identify themselves strongly with 'self-enhancing' values (e.g. materialism, personal ambition, social status) tend not to identify strongly with the antagonistic set of values, that will be called 'self-transcending' (e.g. benevolence, respect for the environment, equality).
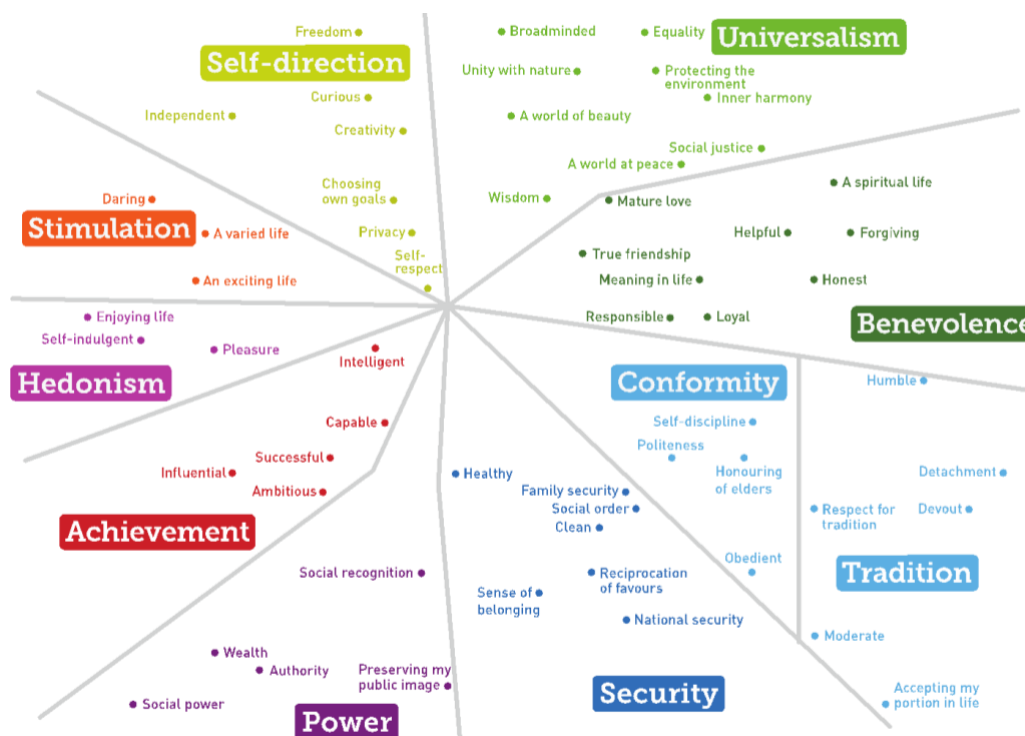

Figure 7: Theoretical model of relations among ten motivational types of values (Schwartz, S. H. 1992).

A major point is that these relationships are not just theoretical – self-transcendent values (especially pro-environmental values and high levels of altruism) correlate positively with willingness to engage in pro-environmental behaviour (e.g., Stern, 2000), concern about environmental risks like climate change (Slimak and Dietz, 2006), and some specific pro-environmental actions such as recycling (Dunlap et al., 1983) and even supporting climate mitigation policies (Nilsson et al., 2004). The conclusion extracted from this is clear: people who identify strongly with self-enhancing values (e.g. materialism) are far less likely to engage in pro-environmental behaviour, because pro-environmental behaviour incorporates values that are antagonistic to self-enhancing values (Crompton and Kasser, 2009; Kasser et al., 2007). Even if people often hold many and divergent values (Gatersleben et al., 2009), promoting the salience of one set of values is likely to reduce the salience of the antagonistic ones (Pakizeh et al., 2007).

The conclusion from this is that appealing to an individual's materialistic nature – for example, by highlighting the economic benefits of a particular pro-environmental behaviour – is an effective strategy for increasing the performance of that particular pro-environmental behaviour, however, the tailoring of environmental messages to promote or enhance self-enhancing values can be severely counterproductive as a strategy for public engagement on climate change (Crompton, 2010; Crompton and Kasser, 2009; Kasser et al., 2007; Nilsson et al., 2004; Slimak and Dietz, 2006).

Another issue for consideration is that segmentation processes also emphasize the differences between individuals, which can be problematic for two reasons. First, increasing the level of social capital in communities – which consists on the productive benefits associated with social relations – is broadly considered to be a key component of sustainable development and the effectiveness of environmental policies (Dale and Newman, 2008; Jones, 2010).
It has been demonstrated that communities with higher levels of social capital are more likely to respond positively to pro-environmental policies, and also engage in pro-environmental behavior, because they are already engaged in cooperative problems solving and tend to trust other individuals from their community more (Jones, 2010). Having said this, segmentation processes does not necessarily reduce social capital but it certainly does nothing to increase it. It is clear that by directing so much attention on the differences between people – and by creating individualized messages and approaches based on these differences – marketing techniques might be inhibiting feelings of empathy and neglecting the potential of social networks in promoting pro-environmental change (Haythornthwaite, 1996; Valente and Pumpuang, 2007; Fell et al., 2009). Individualised messages may work very well for individuals, but is very likely that these carefully crafted messages are not effective at all in social interaction context. Secondly, putting labels into people and categorizing them into distinct segments might be self-fulfilling. An individual who says that is motivated to do environmental behavior with a desire to save money would be labeled as 'disengaged'. The segmentation logics would dictate that this person will only engage in pro-environmental behaviour when financial incentives are present. And this will only strengthen his tendency to act pro-environmentally when these extrinsic incentives are present. This might work in saving energy at home for financial reasons, but there are many arguments against promoting this type of values in the longer term (Thøgersen and Crompton, 2009). It is paramount to

consider that people vary greatly in their levels of concern about pro-environmental behaviour. But when segmentation processes are followed, it is denied the fact that people who are in apparently uneven segments are likely to have so much in common. Logically, when we seek to engage people on the basis of their differences the result will be that these differences are emphasized and even exacerbated. Obviously the 'one size fits all' logic is rightfully dismissed by marketers, and segmentation processes can be hugely valuable to better understand a particular audience. Specifically, this understanding can be valuable because it can allow the marketer to calibrate the audience's existing beliefs and values with the overriding goal of a given campaign, and design a change roadmap. But if there is a mismatch between the message intention and the audience values, and its purpose is entirely subverted (c.f. Platt and Retallack, 2009), then there are also important limits on the value of segmentation as a tool for public engagement.

2.5.2. Spillover or licensing effect

There is an assumption implicit in many marketing-based attempts that often encourage simple, painless, and often low-impact changes in pro-environmental behaviour: that these small changes might create grounds for adopting more far-reaching and environmentally significant changes in the future (Thøgersen and Crompton, 2009).

The idea that little behavioral changes might lead to more ambitious pro-environmental changes is known as the spillover effect (Thøgersen and Crompton, 2009).

Nevertheless, the evidence on the existence of behavioral spillover is not significant. So far. the conditions that lead to this type of effect are not well understood, and even, there is more evidence on an adverse effect that we already mentioned, the licensing effect.

The so-called licensing effect, which has been explained in the previous sections, can be considered as a type of negative spillover effect (Mazar and Zhong, 2010). When engaging in one remarkable pro-environmentally act (e.g., recycling), individuals sometimes feel they earned the moral credentials to engage in other unsustainable behaviours (e.g., a flight to an exotic destination). This is a potential danger of simple campaigns conceptualized with segmentation logics, that only focus on effortless low-impact individual behaviours, without considering their broader social context, which tends to be more complicated.

Multiple psychological theories can help to explain whether spillover effects are likely to happen, and also to which extent. An important one is Self-perception theory (Bem, 1972), which highlights the role of individuals self-identity in any possible behaviour change. It suggests that engagement in pro-environmental behaviour can also lead to changes in individual attitudes and self-identity, that can then reinforce further changes consistent with the changed identity. This is result of the well-known human need for consistency across attitudes and behavior, known as cognitive dissonance (Festinger, 1957). Thøgersen and Crompton (2009) argued that marketing campaigns that enhance and promote the money-saving benefits of a given behavior might not lead to spillover effects, as they fail in promoting a pro-environmental identity. While the prospect of saving money can be very helpful in motivating household energy saving behavior, it fails in triggering critical psychological mechanisms that can make

the performance of other pro-environmental behaviors more likely. Individuals who are reinforced to act ecologically for financial reasons are not likely to feel the obligation to do it when these financial incentives are not present. Similarly, investing in renewable energy projects motivated purely by financial reasons does not encourage individuals to recognize themselves as somebody who acts sustainably. Instead, it reinforces individuals self-perception as people who make money, or helps the environment in an effortless way, meaning that when other behaviors do not make money or are not effortless, they are not likely to be performed. Therefore, what is concluded from this part is that a message biased towards financial incentives can be severely counterproductive and instead, it should try to reinforce an ecological self-identity on users that perhaps could promote further pro-environmental behavior as a result of a positive spillover effect.

2.5.3. Promoting environmental identity

As it is argued in this section, fostering pro-environmental identity or environmental citizenship between individuals is paramount to achieve the gargantuan shifts in lifestyle required to achieve mitigation targets. The set of attitudes, beliefs and values that are base of a pro-environmental identity are sometimes referred to as 'environmental citizenship'. This is a broad term, that can be interpreted very differently. The notion of environmental citizenship recognizes responsibilities as central tenets, rather than viewing them as rights as it happens with liberal citizenship traditions (Dobson, 2003). Environmental citizenship is founded on a belief of the equal distribution of environmental goods and a strong public participation in designing sustainable policies (Dobson, 2010).

Civic responsibility is sometimes referred to be one of the most important motivations to respond behaviorally to climate change (Wolf, 2009). In an analysis of environmental campaigns, Brulle (2010) remarked that the public sphere and the civic institutions are the most important agents affecting change. According to his research, a communication process that fosters civic engagement and dialogue is key. Dobson (2010) concluded that if a sense of environmental citizenship can be promoted along individuals and communities, then it's very likely that any pro-environmental behavior will be deeply rooted in an internal commitment to the values underlying it, rather than to any financial incentive or other types of external stimuli. He also mentions than it is not necessarily "the environment" which motivates environmental citizenship, but a sense of justice and fairness that plays the most important role, reinforcing the empirical evidence demonstrating that self-transcendent values are correlated with pro-environmental behavior (Crompton and Kasser, 2010).

As Dobson (2010) suggests, a notion of environmental citizenship can be enhanced by giving citizens opportunities to participate in local environmental decision-making, by increasing social capital, and by working through existing institutions of social change. This philosophy to promote pro-environmental behavior is very different from the marketing conceptualization of using any method that 'works'.

Therefore, any marketing-based solution should be rooted in a deeper notion of pro-environmental identity and citizenship, otherwise they will not have any important influence on fostering a proportional response to climate change between individuals, helping them to adopt the ambitious behavioral

changes that are required, and also the societal acceptance or even demand for ambitious policy interventions (Ockwell et al., 2009). The overall notion of environmental citizenship has definitely a bigger potential for public engagement with climate change than the one that marketing plays, as it does not only focus on users or consumers behavior but also socio-political participation and civic engagement (Brulle, 2010; Dobson, 2010; Ho ̇ppner and Whitmarsh, 2010).

2.6. Gamification:

In recent years gamification systems were applied in marketing (Muntean, 2011; Shneiderman, 2004) and in many platforms or interactive systems, mainly to improve user experience and engagement (Deterding, Khaled, Nacke, & Dixon, 2011; Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011; Lee & Hammer, 2011; Muntean, 2011).

2.6.1. The DMC Pyramid

The DMC pyramid is a Game Element hierarchy presented in Werbach and Hunter's book "For The Win - Take your business to the next level". Basically, the pyramid is built by three different categories, which belong of different game elements, which are; dynamics, mechanics and components.

Dynamics are the global aspects of the gamified system. They need to be well considered and orchestrated, but they can never be directly entered into the game. Examples of these game dynamics are emotions, progression, relationships, narratives, and constraints.

Mechanics are the basic processes that drive the action forward and generate player engagement. Some examples of these features are challenges, competition, feedback, rewards. Each mechanic can be tied to one or more dynamics.

At the bottom of the pyramid, we find the components. Components are levels, badges, leaderboards, and points, to name a few, and are the most specific form of game elements. Each component is tied to one or more higher-level elements. Putting all these elements together and understanding their influence on each other is the central task of gamification design (Werbach and Hunter, 2012). Below in figure 8, we can see outlined the different elements of the pyramid.
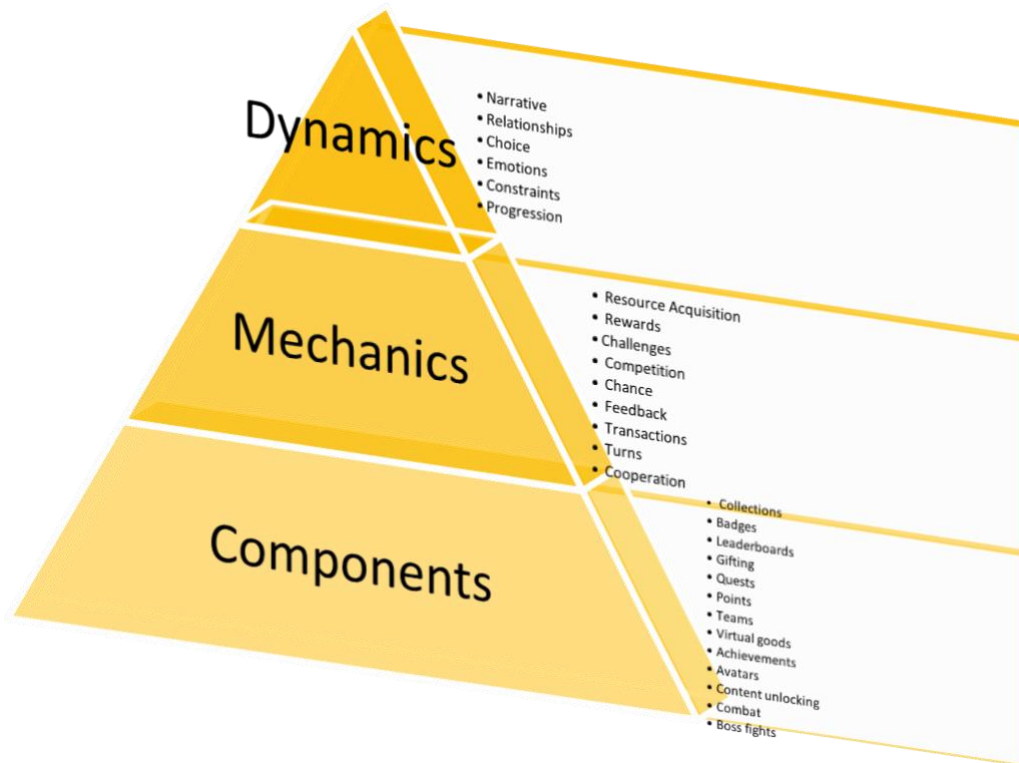
Figure 8: The DMC Model (adapted from Werbach, K., & Hunter, D. 2012)

2.6.2. The Hook Model

The Hook Model describes an experience designed to connect the user's problem to a solution frequently enough to form a habit. Its framework that encompasses four phases: trigger, action, variable reward, and investment and it's intended to make products able to solve user needs through long-term engagement. As users pass through cycles of the Hook Model, they learn to meet their needs with the habit-forming product. Effective hooks transition users from relying upon external triggers to cueing mental associations with internal triggers. Users move from states of low engagement to high engagement, from low preference to high preference. Below, in figure 9, we can see this hook cycle represented visually.

Figure 9: The Hook Cycle

2.6.3. Goals

As the goal setting theory claims, difficult, specific, context-appropriate, and immediate goals, rather than long-term goals, motivate to achieve more (Ling et al., 2005). Goals influence performance by directing oneself attention, mobilizing the individuals and increasing their persistence and belief in the capacity to complete a task (Locke et al., 1981). This theory is most likely to work when the proposed goals are contextually appropriate and challenging enough, the users have sufficient ability to progress, and as this happens feedback is provided. Additionally, the assigned goals should be accepted by the user, and rewards for their realization is another key practice (Locke et al., 1981).

Coupling between the goals and the ability to achieve them is essential for prompting flow state (Pavlas, 2010). The connection between the flow state, games, and intrinsic motivators is well known (Sweetser & Wyeth, 2005). Essentially, to create a good flow experience is crucial to find a balance between the perceived ability of the player and the challenge that the game play increasingly proposes (Chen, 2007; Sweetser & Wyeth, 2005). As it is widely accepted, gradually increasing the difficulty of the challenges is a feature that functions as motivational formula for users' engagement and self-efficacy (McNamara, Jackson, & Graesser, 2009).

2.6.4. Competition and feedback

Taking insighs from The Social ComparisonTheory presented by Festinger (Festinger, 1954; Wood, 1989), we evaluate our beliefs, abilities, and responses by comparing them with those done by other individuals (Gilbert, Giesler, & Morris, 1995; Lillienfeld et al., 2009). As the "similarity hypothesis" concludes, individuals tend to compare themselves with similar others (Festinger, 1954; Gilbert et al., 1995). Taking advantage of this, games eventually display feedback in the context of other players' performance. Comparing different players with quantitative measurements foments competition (Medler & Magerko, 2011) which ultimately can be introduced as a claim to master specific tasks.

As Kruglanski (Kruglanski & Mayseless, 1990) defends, competitive individuals have a stronger appeal to social comparisons than other individuals which perhaps are less competitive. The type of comparison depends highly on the context. Occasionally, comparisons are yielded from a similar individual, and at other times, from a dissimilar other. In the second case, it might be a downward comparison or an upward one (Kruglanski & Mayseless, 1990). Downward-comparison means a comparison with players which are in a worse position than with other players who are better off (Suls, Martin, & Wheeler, 2002). As Wood (1989) states, comparisons can be induced by a self-improvement motive. Upward-comparisons can increase self-evaluation of capacity and motivation since it can increment the faith of improving status (Suls et al., 2002).

2.6.5. Criticism of gamification

Besides the growing interest of industry, gamification has been subject to controversy and critique by some commentators (McDonald, 2010; Robertson, 2010; Wu, 2012) that argued that promoting motivation creating extrinsic rewards (such as points and badges) should be avoided and instead of

doing that, intrinsic motivations should be further explored. Their analysis proves that using extrinsic rewards might have an important negative effect on motivation by undercutting free-choice and self-reported interest in the task in hand (Bielik, 2012; Deci, 1972).

Intrinsic motivation is usually very stable in the long term, and, in contrast to extrinsic motivation, difficult to influence by policy measures. However, attempting to activate intrinsic motivators, although a promising approach at first sight, has not yet been well tested in the context of pro-environmental behavior. However, we can find vast literature on the motivational crowding-out (Rode et al., 2015; Spash & Theine, 2018; Gneezy & Rustichini, 2000b; Falk & Kosfeld, 2006; Bielik et al., 2012, Deci et al., 1972; Kosoy and Corbera, 2010; Gordon et. al, 2015), which considers how extrinsic incentives may have many counterintuitive and counterproductive effects on human behavior. So perhaps gamification can be a promising approach to increase the time users use the app, and therefore increase customer acquisition and retention, but when it comes to help foster pro-environmental behavior, special attention needs to be applied in order not to erode intrinsic motivations.

2.7. Visualization of the ecological footprint:

Providing feedback of ecological performance can help to understand and reflect on behavior or provide information for similar situations in the future (Froehlich et al. 2010; Gollwitzer 1990). Therefore, feedback can be especially useful for behavior whose consequences are either intangible or unknown to many people, such as the carbon emissions of our purchases.
Such communications are intended to improve people's understanding of relevant issues, and if needed, promote behavior change. Unfortunately, this is not always an easy task. Scientific communications fail when the communicators don't know what people needs to know to do informed decisions, the wording that this people is familiar with and which are their current biases (Bruine and Bostrom, 2013). Understanding and communicating something to a given audience is often a harder task than all the previous research performed.

2.7.1. Types of data visualization for the ecological footprint

Many research within the field of Human–Computer Interaction has focused on the so-called eco-feedback technologies, ones that represent visually energy consumption with the goal of promoting pro-environmental behavior (Dillahunt, Mankoff, Paulos, & Fussel, 2009; Elias et al., 2021; Froehlich et al., 2010). However, research in eco-feedback technologies, up until now, has largely focused on changing individual behavior through psychologically grounded principles derived from theories of motivation and behavior change, with few success (e.g. Abrahamse et al., 2005; Froehlich et al., 2010; He, Greenberg, & Huang, 2010; Petkov, Goswani, Kobler, & Kremar, 2012; Petkov, Köbler, Foth, & Krcmar, 2011).

However, concerns regarding the effectiveness in the long-term of these persuasive designs are increasing (Pierce, Schiano, & Paulos, 2010; Strengers, 2011) and researchers emphasize that how

eco-feedback technologies should be conceptualized within the cultural and social background more often (Horn et al., 2011; Strengers, 2011). In the case of this study, the eco-feedback system that is discussed is representing the ecological footprint.

Many platforms assess individuals environmental impact and give them feedback about it. The footprint concept has become increasingly popular due to increasing concern about climate change. Still, individuals are largely unaware of the environmental impact they have. We know that the correlation between their own environmental self-assessment and their real ecological footprint is very low (Bleys, Defloor and Van Ootegem, 2018). It is clear that we need some guidance to understand our impact. To inform people's decisions and public debate, scientific experts at government agencies, nongovernmental organizations, and other organizations have to provide understandable and scientifically accurate communication materials.

Generally, we can distinguish between two types of visualization of data, which are, pragmatic visualization and artistic visualization. Kosara (2007) uses the concept of the sublime to differentiate them; while the former is, according to him, designed to get rid of any sublimity, and instead foster immediate understanding, the latter must introduce enough of an enigma to keep the audience interested, without being easy to solve. Viegas and Wattenberg (2007) considers artistic visualization is radically different from traditional scientific visualization, which he defines as a tool to support analytic reasoning. Nowadays, is widely recognized the fact that artistic visualization has the potential to make a visualization express a point of view. Traditional analytic visualization schemes are inherently different, as they are intended to minimize distortions, as that may interfere with dispassionate analysis. Concluding, I consider artistic visualization challenges the notion that visualization is possibly - or even - desirably neutral; rather, visualization can and perhaps must be used to persuade as well as to read data. Being that said, the degree to which either (or both) approaches are utilized remains highly dependent on the context.

While interest in eco-feedback technologies has peaked significantly over the last decade, current research highlights that simply providing information to individuals regarding their consumption habits does not guarantee behavior change at all. The main point of using a visualization methodology or another is to reduce abstractness. Allowing individuals to understand the impact of their actions can help to facilitate relevant emotions and reduce perceived abstractness, connecting with the visualization. To understand how the user connect with different visualization methodologies, the first step is to understand what motivates the users. And characterizing individuals' latent motivations that perhaps could drive sustainable behaviors, is a subject that is being investigated without having much evidence. In a previous study made by the author, under the scope of the curricular unit "Project in Energy Engineering and Management, Mode 1", which goal was to do a comprehensive analysis on which visualization methodologies can better represent the Ecological Footprint, the main conclusion taken was that none of the visualizations methodologies was clearly outstanding among the others. Taking as conclusion that motivation nature is complex since human nature is complex. Even though results were even, it was concluded that the most motivating visualization methodology was the one leveraging on

social comparison. As it has been commented with more detail previously, the social comparison can be an effective motivation for many people. Therefore, this one has been proved to be the most effective strategy to increase motivation and foster behavior change through a visualization methodology. Yet, little is known when it's about understanding what motivates people to act in certain ways and engage in pro-environmental behaviors and if a visualization strategy can make a difference.

2.7.2. Ecological feedback: motivating or discouraging?

Disregarding the fact that one visualization methodology can be more effective than others, an important point to consider is if showing the ecological feedback to users is always going to help. Users are highly unlikely to be motivated to change their unsustainable behaviors if they don't realize first that those behaviors they have are not aligned with the goal of protecting the environment (cf. Carver & Scheier, 1981). Due to the fact that most people in developed countries live an environmentally unsustainable lifestyle, the feedback that ecological footprint test provide is generally negative. There is strong evidence demonstrating that the ecological footprint feedback may not help in promoting pro-environmental behavior, as it might reduce feelings of self-efficacy, which might end up lowering intentions to engage in behaviors that would help reduce global warming (Brook, 2011).

Some psychological theories suggest that individuals which were provided with a negative ecological footprint feedback might react by changing their environmental views to match their behavior, instead of changing their environmentally damaging behavior. When we do something inconsistent with our attitudes, we experience cognitive dissonance (Aronson, 1969, 1999; Festinger, 1957). One frequent way to reduce this uncomfortable feeling is to change future behavior to match the attitude, as the ecological feedback designers would hope. However, there is plenty of empirical research showing that, because changing behavior is not always easy, people usually reduce dissonance in easier ways, like changing their attitudes to match their negative behavior (Cooper & Fazio, 1984; Festinger & Carlsmith, 1959), Therefore, as Brook (2011) concludes, ecological feedback can either increase or decrease environmentally sustainable behavior, depending on how much people have committed to environmentalism through investing their self-esteem in it. So the ecological feedback should only be provided whenever there is no risk on reducing subsequent pro-environmental behavior (which is to say, only provide it to people who already invested time in environmentalism).

3. Methodology

The process of this research is outlined below in figure 10. It was divided into two phases; *Theoretical phase,* which contains an integrative literature review that concluded in the elaboration of a theoretical framework, and *the practical phase,* that addresses the business case of Seeds.

Figure 10: Methodology of the dissertation

3.1. Theoretical phase:

The purpose of this phase was to complete the research formulation. This included background research of all the relevant research areas and also an analysis of Seeds business case, to assertively propose a scientific question that was aligned with Seeds overall strategy and vision. Once this scientific question was clear, an integrative literature review was conducted, to later summarize all the findings into an integrative theoretical framework.

The integrative literature review was done by following the guidelines of Torraco et. al (2005).

This method allowed to do an analysis of the literature that moved beyond the mere description of a body of evidence, but also help deriving new insights through integration and critique'. (Elsbach and van Knippenberg, 2018, p. 2). Having into account that this area of research area is quite new (or perhaps too unexplored), this research method was thought to be the most suitable. In words by Post et al. (2020, p.352): 'In novel or emergent research areas, integrative literature review articles can connect research findings from various disparate sources in original ways so that a new perspective or phenomenon

emerges. Also, following this methodology made possible elaborating an Integrative Theoretical Framework that summarized all the findings. This framework was conducted by following the method "*understanding, selecting, and integrating a theoretical framework in dissertation research*" (Grant et al. 2015)

3.2. Practical phase

This phase's purpose was to apply in a real business case, some of the concepts that were assessed in the theoretical phase. This included carefully examining the Seeds gamification strategy, that was designed by following the methodology proposed in the book *Hooked: How to build habit-forming products* (Eyal, N., & Hoover, R., 2014). After conducting a critical review of this method and the resulting gamification strategy, another gamification approach was proposed. This approach considered the findings from the integrative theoretical framework and was designed by following the six Steps to Gamification, commonly known as 6D method (Werbach and Hunter 2012).

This method was believed to be a less aggressive gamification implementation than the Hooked methodology, and it's believed to be a more suitable to drive pro-environmental behavior, however, the testing and validation of this hypothesis was out of the scope of the thesis.

4. Theoretical Framework for a sustainable gamification implementation

The framework in figure 11 is based on the analysis done in the literature review, and it has been conceived by following the method "*understanding, selecting, and integrating a theoretical framework in dissertation research*". The proposed framework can serve as a "route map" in designing sustainable gamified engagement strategies. Each key insight will be further discussed hereafter.
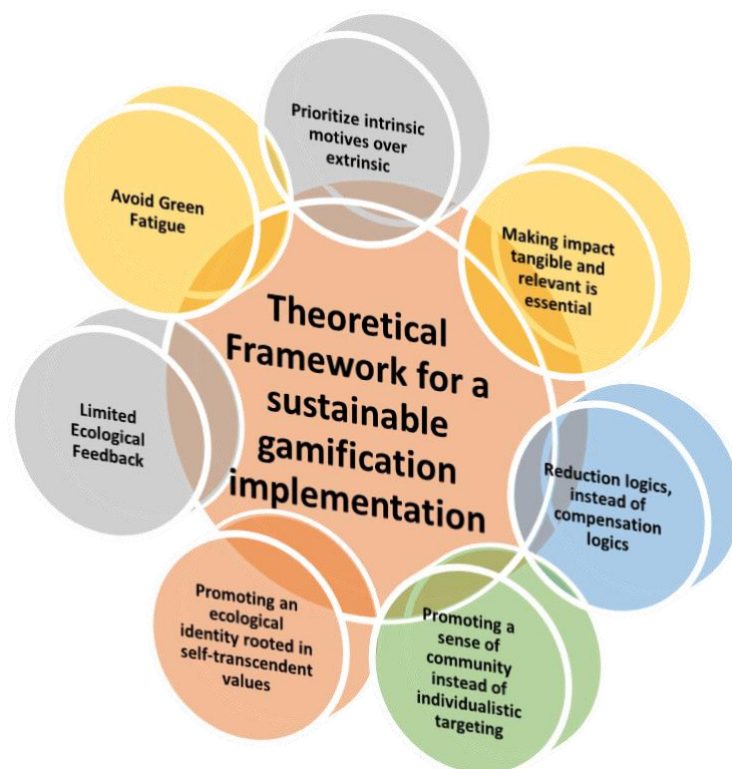
Figure 11: Theoretical Framework

- **Intrinsic vs extrinsic tradeoff**

Promoting the extrinsic benefits of engaging in a pro-environmental behavior along with intrinsic benefits can be less impactful than communicating only the intrinsic benefits. As the current research has remarked in several occasions, intrinsic motivations have been proved to be very stable over time, and to be more robust to any extrinsic financial incentive (Rode et al., 2015; Spash & Theine, 2018; Gneezy & Rustichini, 2000b; Falk & Kosfeld, 2006; Bielik et al., 2012, Deci et al., 1972; Kosoy and Corbera, 2010; Gordon et. al, 2015) and moreover extrinsic motives are not compatible with intrinsic motives (Bolderdijk, Lehman, and Geller 2012; Edinger-Schons et al. 2018).

Therefore, in case there is a tradeoff, it is recommended to communicate the intrinsic value of a given pro-environmental behavior alone.

- **Promoting a sense of community instead of individualistic targeting**

Going in line with the recent individualized discourse of climate change; individual citizens (users) are targeted for their individual role in causing emissions, and urged to change the situation. This individualistic framing of climate change might be problematic for people, for two reasons. First, it does not show society as it is actually experienced, which is to say, as an interconnected network of social relations. And second, there is an evident tension with the representation of climate change as a collective problem and the strong focus on individuals' behavior, which might be a bit paradoxal (Butler, 2010). One key finding of current research on environmental psychology is that fostering a sense of community is paramount to sustain long-term behavior change.

There are many pro-environmental behaviors that often require collective as opposed to individual action (Bamberg, Rees, and Seebauer 2015).

The challenge than collective action poses is relevant to show how social influence operates with regards to sustainable actions. When individuals see others engaging in a particular action, this can increase their perception of collective efficacy or, as Bandura defines it (1997, p. 447) a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainmentsact. Surprisingly, collective efficacy has been understudied in the sustainability domain, but seems to be a promising approach. In other contexts, such as the organizational leadership (Chen and Bliese 2002) and political action (Velasquez and LaRose 2015) it's influence is clear and validated. Drawing on these studies, we suggest that collective efficacy can be a good motivator of pro-environmental behavior.

Communicating actions in a group context will increase the tendency to engage in sustainable actions, as a result of increased collective efficacy. Additionally, creating a sense of community can be key to sustain long-term behavior change.

- **Promoting an ecological identity rooted in self-transcendent values (environmental citizenship):**

Some studies conclude that individuals report higher environmental identity after engaging in certain environmental behaviors (van der Werff, Steg, & Keizer, 2014). These studies suggest that the reinforced environmental identity appears to strive pro-environmental behaviors by strengthening one's personal norms to act sustainably (van der Werff, Steg, & Kaiser, 2013). Also, this can promote further pro-environmental behavior as a result of a positive spillover effect. Evidence for such spillover and an understanding of when and how it may occur are still limited.

In any case, there is significant evidence demonstrating that self-transcendent values are correlated with pro-environmental behavior (Crompton and Kasser, 2010), so the identity that should be promoted ideally has its values. According to Crompton (2010), for what he calls "bigger-than-self" issues like

environmental protection (or any other issue that may not be in an individual's immediate self-interest to invest energy and resources in helping to solve), campaigns that promote self-enhancing values may actually weaken the common purpose that links them. Crompton is based on empirical findings from social psychologists who demonstrated that particular personal values, such as materialism or self-interest, can end up inhibiting behavioral expressions related to the antagonistic cultural values, namely co-operation or pro-environmental behaviour (Kasser et al., 2007; Maio et al., 2009).

As it has been remarked previously, promoting a sense of environmental "citizenship" can be a good way to link any pro-environmental behavior in the values underlying it, rather than to any financial incentive or other types of external stimuli. In words of Dobson (2010), it is not necessarily "the environment" which motivates environmental citizenship, but a sense of justice and fairness. Some studies demonstrated that individuals which have a perceived ability to restore justice can lead to certain pro-environmental behaviors such as selecting fair-trade products (White, MacDonnell, and Ellard 2012), it might be the case that conveying collective notions of justice (e.g., communicating information about collective impacts and consequences of unjust, unsustainable actions) can be useful in fostering a environmental citizenship notion. In particular, communication about negative environmental threats and how these are felt by communities that are the most vulnerable might be a compelling message (Lazarus 1994). Additionally, motivating individuals to participate in local environmental decision-making can also be positive to foster environmental citizenship.

Promote environmental identity by promoting self-transcendental values, or a notion of "environmental citizenship" can be a very effective method of fostering pro-environmental behavior. A way to motivate that citizenship notion is by giving information about climate justice and also by motivating individuals to participate in local decision making.

- **Reduction instead of compensation logics**

When it comes to talk about ways to improve the ecological performance of users, the compensation or offsetting logics is highly disadvised. The growing trend of market-based compensation mechanisms for nature conservation is very likely to crowd-out intrinsic motivations (Rode et al., 2015; Spash & Theine, 2018; Gneezy & Rustichini, 2000b; Falk & Kosfeld, 2006; Bielik et al., 2012, Deci et al., 1972; Kosoy and Corbera, 2010; Gordon et. al, 2015) and has been proved to be very ineffective, as there is no evidence of reduction or avoidance of emissions due to markets so far (Chomitz, 2006; Lohmann 2005; Böhm and Dahbi, 2009; Spash, 2010). Instead, what this research suggests is to promote a philosophy of reduction, rather than persuading individuals to outsource greenhouse gases reductions.

The easiest way of decreasing the greenhouse gases at individual level is by reducing the consumption levels. Perhaps promoting a philosophy of reduced consumption can help.

- **Limited ecological feedback**

Ecological feedback should only be provided whenever there is no risk on reducing subsequent pro-environmental behavior. There is strong evidence showing that ecological footprint feedback may not help in promoting pro-environmental behavior, when it reduces feelings of self-efficacy.

In the other hand, other recent studies specifically observed that social recognition of prosocial acts reduces prosocial striving, while without social recognition prosocial striving is encouraged. (Susewind et al. 2020) This makes sense under the assumption that people can only derive a sense of progress or personal goal attainment from their symbolic activities when these activities are recognized by others. This suggests that negative spillover is likely to occur when there is social acknowledgment of a given pro-environmental act.

It is suggested that ecological feedback is only shown when there is no danger of reducing feelings of self-efficacy. This is the case of people who don't identify strongly with environmentalism and have very negative ecological feedback. Also, when the feedback is positive, the possibility of social acknowledgment should be limited, or it might end up with negative spillover.

- **Making impact tangible and relevant is essential**

The long-time horizon associated with pro-environmental behavior might make it costly to the present self. Sometimes, the positive sustainable outcome in the future is often to prioritize over oneself own affective benefits. However, acting in a manner that can help other individuals has been shown to provide positive affect, sometimes termed as "warm glow" effect (Giebelhausen et al. 2016). Focusing on how sustainable behaviors can create positive affect in the present might increase the likelihood of subsequent ecological behaviors. We propose that:

Making sustainable impacts seem local and relevant to the self, by framing them with an immediate (vs. long-term) positive affect, can increase the likelihood of its performance.

- **Avoid green fatigue**

Climate change is a serious, nebulous, and can have large-scale consequences. This can make that individuals perceive their acts as small and inconsequential, leading to green fatigue. This form of demotivation is the result of information overload and lack of hope with regards to meaningful change (Strother and Fazal 2011), and such hopelessness can be demotivating to individuals (Guyader, Ottosson, and Witell 2017). One suggestion might be to celebrate small and concrete wins that can reinforce positively more sustainable actions and keep individuals engaged with the climate action.

Rewarding small milestones can encourage people to continue engaging in pro-environmental behaviors by helping avoid green fatigue.

5. Seeds: A case study

Seeds is an environmental FinTech mobile app that uses crowdfunding to combine many micro-investments into project finance loans, which provides users with a competitive return on investment with added social value. Seeds uses a round-up feature that rounds up the users' credit card transactions to the nearest Euro, accumulates these spare changes and letting users invest them in renewable energy projects of their choice. Seeds objective is to finance energy collectives looking for funding, and also renewable energy projects for energy cooperatives. These projects are usually community focused, increasing its added value and increasing the community interaction and interest. Once the projects are fully funded, the user who supported them receive payments plus interest on the loan.

5.1. Seeds' Unique Selling Proposition

Seeds has two types of customers, the investor profile and the renewable energy project developers. The product offered to the investors (B2C) is a mobile app through which they can easily and effortlessly invest in the renewable energy project of their choice and consequently help tackle the climate crisis. Users have the option to become carbon neutral through the calculation of the carbon offset equivalences of their investments. The other customer profile corresponds to the B2B side. Seeds offers RE project developers a way to finance their projects by enhancing community engagement without the challenges of traditional banking. The main Seeds unique selling proposition (USP) is the round-up investment methodology, enabling our users to invest in renewable energy projects with a starting price point of just the spare change from their everyday purchases. Instead of aiming for a higher price tag per investor – Seeds is focusing on long-term engagement through micro-investments which use the volume of the environmental movement to finance projects instead of single high net worth individuals. Seeds' goal is to enable environmentally concerned individuals at any financial level to invest in the energy transition. By tracking the Seeds team's expenses over 6 months it was found that the spare change from the round-ups add to approximately 17,50€/month – By scaling to a feasible FinTech community size of 1 million users Seeds would handle 210.000.000€ per year of new assets under management.

An additional USP is the web app solution. The current trend of explosive growth within the FinTech industry has proven that the wave of mobile app based digital banking, payment services and financial securities trading are disrupting incumbent financial services. FinTechs have the distinct advantage of accessibility at all times as smartphone usage continues to penetrate to the vast majority of the population. At the moment all the competitors within the RE crowdfunding space offer web portal-based services while Seeds is a first mover into the environmental FinTech space. This is a strong competitive advantage as Generation X, Millennials and Generation Z disproportionately use mobile applications over desktop-based web portals. Finally, the last significant USP is providing investors with the CO_2-equivalence of the micro-investments, enabling them to track and offset their personal carbon footprint. As part of the app experience a user will provide information on their consumption habits such as diet,

transportation, housing and more. Also, there is the option of tracking user's environmental impact of their daily purchases. Once the overall emissions of their spending behavior is computed, they would be compared to the emissions that the micro-investments would represent. The investments carbon savings would depend on the project characteristics and location. On the figure 12 we can see it exemplified. This concept is further explained in the following section.

Figure 12: Round up mechanism

[1] Computed with Coffee Footprint calculator (https://www.omnicalculator.com/food/coffee-footprint)
[2] Carbon prices range from less than US\$1/tCO$_{2e}$ to US\$119/tCO$_{2e}$, with almost half of the covered emissions priced at less than US\$10/tCO2e (World Bank. "State and Trends of Carbon Pricing 2020")
[3] Quantity of carbon offset will depend on the project characteristics & location; values will be similar (Seeds Business plan, 2021).

5.2.   Previous gamification strategy:

The Seeds first engagement strategy was designed taking as a reference the book "Hooked: how to build Habit-forming products",

To have a better understanding on the core concept of the model this book proposes to help businesses build traction with their users (*The Hook Model*), below we can find a little excerpt: *"Cognitive psychologists define habits as "automatic behaviors triggered by situational cues": things we do with little or no conscious thought.5 The products and services we use habitually alter our everyday behavior, just as their designers intended.6 Our actions have been engineered.*
How do companies, producing little more than bits of code displayed on a screen, seemingly control users' minds? What makes some products so habit forming? Forming habits is imperative for the survival of many products. As infinite distractions compete for our attention, companies are learning to master novel tactics to stay relevant in users' minds. Amassing millions of users is no longer good enough. Companies increasingly find that their economic value is a function of the strength of the habits they

create. In order to win the loyalty of their users and create a product that's regularly used, companies must learn not only what compels users to click but also what makes them tick. Although some companies are just waking up to this new reality, others are already cashing in. By mastering habit-forming product design, the companies profiled in this book make their goods indispensable"

In table 2 we can find the Hook model applied to the business case of Seeds.

Table 3: The Hook Model applied to Seeds

Element	Definition	Applied to Seeds
Trigger:	A trigger is the actuator of behavior—the spark plug in the engine. Triggers come in two types: external and internal. Habit-forming products start by alerting users with external triggers like an e-mail, a Web site link, or the app icon on a phone. By cycling through successive hooks, users begin to form associations with internal triggers, which attach to existing behaviors and emotions. When users start to automatically cue their next behavior, the new habit becomes part of their everyday routine.	**What do users really want? What pain is Seeds relieving? (Internal trigger)** *Alleviate feelings of consumer eco-guilt every time users make a purchase* **What brings users to your service? (External trigger)** *A phone pop-up.*
Action	Following the trigger comes the action: the behavior done in anticipation of a reward. This phase of the Hook, draws upon the art and science of usability design to reveal how products drive specific user actions. Companies leverage two basic pulleys of human behavior to increase the likelihood of an action occurring: the ease of performing an action and the psychological motivation to do it.	**What is the simplest action users take in anticipation of reward, and how can you simplify your product to make this action easier?** *Clicking the phone screen to go to the Seeds app*
Variable reward	Variable rewards are one of the most powerful tools companies implement to hook users. Research shows that levels of the neurotransmitter dopamine surge when the brain is expecting a reward. Introducing variability multiplies the effect, creating a focused state, which suppresses the areas of the brain associated with judgment and reason while activating the parts associated with wanting and desire. Although classic examples	**Are users fulfilled by the reward yet left wanting more?** *Yes. The variable reward was the ecological impact of every round up. With every purchase the users did, a certain amount of money was automatically invested into the renewable energy project they selected. Which means that those cents had a variable environmental*

	include slot machines and lotteries, variable rewards are prevalent in many other habit-forming products, such as pinterest, facebook, twitter, or even the email; for many, the number of unread messages represents a sort of goal to be completed… However, variable rewards are not magic fairy dust that a product designer can sprinkle onto a product to make it instantly more attractive. Rewards must fit into the narrative of why the product is used and align with the user's internal triggers and motivations	*impact, depending on the amount of money invested (the round up was basically the difference to the nearest euro of the purchase) and the project in case. So, the daily hook was to see how their emissions were being compensated automatically without being able to predict at which pace it was happening.*
Investment	The last phase of the Hook Model is where the user does a bit of work. The investment phase increases the odds that the user will make another pass through the Hook cycle in the future. The investment occurs when the user puts something into the product of service such as time, data, effort, social capital, or money. The more effort we put into something, the more likely we are to value it; we are more likely to be consistent with our past behaviors; and finally, we change our preferences to avoid cognitive dissonance. These commitments can be leveraged to make the trigger more engaging, the action easier, and the reward more exciting with every pass through the Hook cycle. The big idea behind the investment phase is to leverage the user's understanding that the service will get better with use (and personal investment). Like a good friendship, the more effort people put in, the more both parties' benefit	**What "bit of work" do users invest in your product? Does it load the next trigger and store value to improve the product with use?** Users were urged to compute their ecological footprint and learn more about the impact of their investments and their spending behavior. Shortly after computing their ecological footprint, they could compare their performance with other users, in a virtual community. The effort was supposed to scale by giving users more tools to reduce their emissions, by following tips or challenges, or investing more money.

More details and mock ups of this gamification strategy can be found in the appendix B.

Discussion: does this strategy help foster pro-environmental behavior?

While some game elements, such a progress bar, badges or a leaderboard are not necessarily bad, the main issue lies on how the investments are framed. On basis of the theoretical framework, in particular the point "**Reduction logics, instead of compensation logics**" it is suggested that framing investments as carbon offsets could erode the intrinsic motivation that voluntary efforts typically require (Rode et al., 2015; Spash & Theine, 2018). Having into account the findings on the adverse effects of monetary compensation on performance (Gneezy & Rustichini, 2000b), it is suggested that the monetization of greenhouse emissions that is associated with offsetting practices can suppress the intrinsic motivation to engage in environmentally friendly behaviors (Falk & Kosfeld, 2006).

Furthermore, following the theoretical rationale of mental accounting and moral licensing, studies reveal that individuals strategically seek opportunities to perform minor good acts (which could be interpreted as Tokenism) when foreseeing morally doubtful choices (McDonald et al., 2015; Merritt et al., 2012; Merritt et al., 2010). These minor good acts could then give individuals a moral license to engage in polluting behaviors (Merritt et al., 2010). Concluding, it is suggested that the underlying principle of this reasoning is help individuals reduce the cognitive dissonance and guilt but not their emissions. Below, in figure 13, we can see a visualization of the dashboard of this gamification approach.
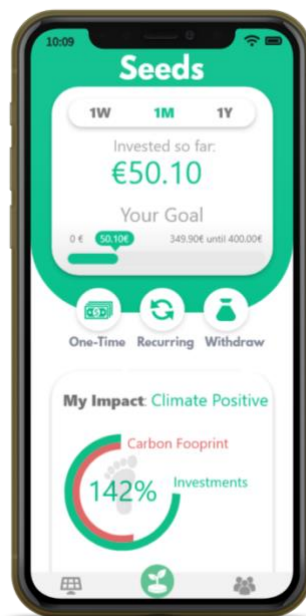
Figure 13: Previous Gamification Strategy Main Dashboard

Last point against this is that it would be difficult to overcome the contradiction of promoting the behavior "people investing into renewable energy projects" without justifying or increasing current levels of consumption. To have a good performance in the first behavior, the more purchases, the more round ups will sum up into investments. This clearly undermines the achievement of the long term pro-environmental behavior "reduce consumption".

On the other hand, providing tangible feedback on the impact of the users can be very positive, if the impact is contextualized to be tangible and relevant for the user. Having into account that the visualization methodology that it was proposed has not been tested, this point remains unclear.

Also, the levels are good to reflect status and mark progression. They are recommended to increase feelings of self-efficacy, which can be a good motivator to progress in a given context.

The competition aspect is not well-understood. Combining a leaderboard with points adds a social dimension with an unknown effect on motivation: it may either promote intrinsic motivation by experiencing competence, or reduce intrinsic motivation.

5.3. Proposing a new framework for sustainable gamification

Based on the findings in the previous phase, a new gamification proposal will be drafted. The framework is based on the methodology proposed by Professor Kevin Werbach, called Gamification Design Framework, which is well-reviewed by many researchers. It includes 7 game elements, and it successfully managed to have into account some of the points extracted from the theoretical framework. It also includes carefully selected information from previous studies on gamification for sustainable behavior, by extracting the most frequently appearing factors associated with successful gamification interventions for sustainable platforms.

Following the Gamification Design Framework by Kevin Werbach, the first step is to align the framework with the business ultimate objective.

5.3.1. Define business objectives

It is critical to think about the business goals to make sure that the gamified system benefits the organization. Therefore, the first step of this framework is defining the business objectives. According to Seeds CEO William Wiseman, their fundamental business goals is:
- Incentivize users to invest in renewable energy projects and engage frequently with the app

5.3.2. Defining the target group

Research suggests that a key element to successfully apply gamification is segmentation. Despite the previously mentioned limitations that these techniques have, it is important to calibrate the approach to make sure that will match the focus group. Additionally, it is important to know users as any gamification strategy is more likely to succeed when the business objectives and the user objectives overlap (Morschheuser, Hassan, Werder, Hamari, 2018).

The method that has been considered to do this segmentation process in a game context is the Bartle Taxonomy of Player Types. According to Richard Bartle, we can distinguish four types of players; Achievers, explorers, socializers, and killers, each one with different motivations and propensities. Achievers prefer raising points, badges, and rising in levels or other concrete measurements of success which the game might have. Explorers like to immerse themselves in the game world and love discovering new content. Socializers enjoy engaging with other players rather than the game itself. Lastly, the Killers thrive on competition and like to fight with others. As researchers suggest, the most successful gamified systems have something to offer to each player type (Bartle, 1999).

5.3.3. Delineate target behaviors

A third important aspect of the 6D approach to implement gamification is to define target behaviors. Target behaviors should be concrete and specific, and therefore the overall target has to be broken down. Conceivable target behaviors are as follows:

- Download the app
- Connect the credit card to the app
- Incentivize users investments in renewable energy projects.

5.3.4. Result

The framework proposed is based on critical factors found from theory and previous studies on gamification. These are; the three dimensions of Werbach and Hunter's DMC Pyramid (Dynamics, Mechanics, Components), the player types, motivation type (Intrinsic or Extrinsic) and finally the alignment with Seeds business goals and any successful pro-environmental key insight.

For each game element presented, these factors were used to evaluate the specific design proposal, resulting in a 8x8 matrix to evaluate a given prototype based on these factors.

Table 4: Proposed gamification implementation.

Game element	Implementation guidelines	Supporting business goals	Dynamics / Mechanics / Components	Type of Motivation	Player type
Levels	• Levels can help reduce green fatigue by rewarding small milestones • It is advised that levels are based exclusively on the ecological impact the investments generated. This is a way to promote intrinsic over extrinsic motivations, and promoting an ecological identity rooted in self-trascendent values. • Also, it is highly recommended to include levels for teams, as this could create a sense of community and increase collective efficacy.	Yes	**Dynamics:** Progression *(the player's growth and development)* **Mechanics:** Feedback *(information about how the player is doing)* Rewards *(benefit from some action or achievement)* **Components:**	Extrinsic	Achiever Socializer

				Levels *(defined steps in player progression)*		
Leaderboard	• It is a simple feature, but it can be demotivating if implemented wrong. It should not be static, therefore it is suggested to have multiple leaderboards, one for individuals and another one for teams. That would be a simple way to make it dynamic while fostering a sense of community at the same time. It is suggested to create another leaderboard based in the geographical locations of the users, as is it believed to be an effective way to make impact local and relevant to the self. • It is unknown how a good positioning on the leaderboard might result in negative spillover	Yes	**Dynamics:** Emotions *(curiosity, competitiveness, frustration, happiness)* Progression *(the player's growth and development)* **Mechanics:** Competition *(one player or group wins, and the other loses)* **Components:** Leaderboard *(visual display of players progression and achievement)*	it may either promote intrinsic motivation by experiencing competence, or reduce intrinsic motivation.	Achiever Socializer Killer (weak)
Teams	• The player can choose to build a team with his/her friends (which would increase collective efficacy) and compete with other teams, or join a team in their hometown (which would be a way to increase a sense of community and frame the impact with an immediate positive effect).	Yes	**Dynamics:** Relationship *(social interactions generating feelings of camaraderie, status, altruism)* **Mechanics:** Cooperation *(players must work together to achieve a shared goal)* **Components:** Teams *(defined groups of players working together for a common goal)*	Extrinsic	Achiever Socializer Killer (weak)
Gifting	If a marketplace is available within the platform. If a project was funded too quickly, other investors might be gifting selling his/her position.	Yes	**Dynamics:** Emotions *(curiosity, competitiveness, frustration, happiness)* Relationship *(social interactions generating feelings of camaraderie, status, altruism)* **Mechanics:** Transaction *(trading between players, directly or through intermediaries)* **Components:** Gifting *(opportunities to share resources with other)*	Intrinsic	Explorer (weak) Socializer (strong)

Feedback	• Progression/feedback and setting your own goal can trigger intrinsic motivation. However, is it suggested to separate the impact goals of the financial ones,	Yes	**Dynamics:** Progression *(the player's growth and development)* **Mechanics:** Feedback *(information about how the player is doing)* **Components:** Collection *(sets of items or badges to accumulate)*	Intrinsic	Explorer Achiever
Quests.	• Spontaneous challenges to be provided to the player when not expected • Easily combined with other components, and can foster ecological citizenship notion if the quests prove information about climate justice. • It is suggested that the quests intend to motivate the user to learn how to reduce the emissions associated to their spending behavior, showing ecological feedback in a way that does not decrease their self-efficacy (otherwise this could lead to a negative spillover effect).	Yes	**Dynamics:** Emotions *(curiosity, competitiveness, frustration, happiness)* **Mechanics:** Chance *(Elements of randomness)* **Components:** Quests *(predefined challenges with objectives and rewards)*	Extrinsic	Explorer Achiever
Badges and trophies	• Players can unlock achievements and badges as they play, but they would have to be contexualized carefully. Ideally, they should try to promote an ecological identity rooted in self-transcendent values. • This feature needs continuous improvement, otherwise the player might finish and stop playing. • Little rewards can help avoiding green fatigue. • This feature can involve other components, such as levels, points and badges.	Yes	**Dynamics:** Emotions *(curiosity, competitiveness, frustration, happiness)* Progression *(the player's growth and development)* Relationship *(social interactions generating feelings of camaraderie, status, altruism)* **Mechanics:** Resource acquisition *(obtaining useful or collectible items)* Challenges *(puzzles or other tasks that require effort to solve)* Chance *(elements of randomness)* **Components:** Achievements *(defined objectives)* Badges *(visual representation of achievements)* Collection *(sets of items or badges to accumulate)*	Extrinsic and intrinsic	Explorer Achiever

6. Conclusions:

The question that this study was evaluating: *Is it possible to foster pro-environmental behavior through a gamified app to invest in renewable energy projects?*

The conclusion is that it will be changeling to create a stronger incentive for consumers to engage in pro-environmental behaviors by using a gamified app to invest in renewable energy projects. There are many barriers to overcome; while some are implicit in the inherent logics of gamification and marketing techniques itself, the others are found in the human psyche. What this analysis has underlined is that no marketing approach can be 'value-free', being clear that marketing logics have the principles of the current economic rationality firmly embedded within it. Some key features might end up undermining pro-environmental behavior (segmentation based on individuals' differences, an individual-focused approach, extrinsic rewards). It is suggested that any conventional marketing implementation would have overlooked any of these aspects, at the expenses of the utmost objective of maximizing profit.

The previous arguments can lead to the question: can climate change and the broader problems of sustainable resource use and environmental degradation be successfully tackled with the current deregulated, globalised, growth-based economy (see, e.g., Jackson, 2010). Perhaps, to the extent that this is not really a sustainable economic model, all marketing approaches that operate within it are highly unlikely to be either.

The conceptual tools that corporations use to engage the public are inherently biased towards making profit. On that basis, it is considered crucial to equip ourselves with tools for change which are not constrained by this perspective. That being said, it is unclear to which extent the proposed framework can help individuals adopt pro-environmental behaviors, as further validation would be required.

Despite of this being uncertain, the second question will be addressed: *"If it is, which are the critical success factors to implement this green gamification approach?"* the basis of the answer is found in the theoretical framework. Also, the key points with regards to its implementation is that all of the game-components are motivating for all different player types (Achievers, explorers, socializers, and killers), touching different dynamics and mechanics, and trigger both intrinsic and extrinsic motivation.

It is uncertain if the new gamification strategy can be more successful than the previous methodology proposed, but surely it is a more ethical approach. Ethics traditionally always ranked the social benefits above the individual benefit. As Kant defined, an action is especially moral when it benefits others at expense to one's own benefit. It's been a while since corporations separated from morality to pursue a purely material goal, which is the maximization of profit. Sometimes this utmost objective can be quite immoral, as how the money is made does not matter. A similar thing can be observed in other fields such as the natural sciences; researching without morally evaluating or even regulating research. For example, the discovery of atomic energy enabled both the use of this energy form and the development

of the atomic bomb. Ultimately, however, it is suggested that a society should prevent this kind of science from being used against it. The essential question of the benefit or harm to human beings should be stated as early as possible, to avoid implementing things that can represent a societal damage.

This being said, it is completely disadvised to build habit-forming technology (as the previous gamification strategy pursued by following the Hook model). In words of Roy Amara, past president of The Institute for the Future "We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run" (Rattclife, 2016)

According to their famed investor Paul Graham, society didn't have time to develop "antibodies to addictive new things." According to him, responsibility is on the user side: "Unless we want to be canaries in the coal mine of each new addiction —the people whose sad example becomes a lesson to future generations—we'll have to figure out for ourselves what to avoid and how." (Graham, 2013)

This type of mentality enhances tech developers to design habit-forming products — products that draw consciously on the same design principles that the casino industry pioneered. The predictable result is that most tech users spend more time on device than they would like, about five hours of phone time a day, while a substantial minority develop life-changing behavioral problems similar to problem gambling (Langvardt, 2019). Even now, after all of the criticism that has been leveled against big tech, the basic threat to freedom and dignity has received relatively little public attention (see, e.g., Frischmann & Selinger, 2018). But the issue is simply too big to ignore. Perhaps by taking habit-forming design as a serious threat for the public, we can begin to develop the social response that could confront that challenge successfully.

7. Limitations and future research:

This research has been multidisciplinary and, therefore, benefited from multiple methodologies. While such diversity could be seen as a strength, it has also resulted in a set of disconnected literatures. The results proposed in this work are an attempt to organize the existing literatures and try to explain and integrate its contradictions, while providing a unifying theoretical model and gamification implementation approach that can – and perhaps should – be further tested and explored.

The main limitation of the research is fairly obvious; it is missing validation of the hypothesis stated. Gamification has never been applied in practice to evaluate if it can be compatible with fostering sustainable behavior in an investing platform.

In order to make a more impactful integrative literature review, the boundaries conditions should have been narrowed down more, and stated more clearly. Also, the presented theoretical framework should have been validated by experts in relevant areas.

Another point is that the method for this research was quality-based rather than quantity. In future research, it could be of interest to conduct a quantity-based evaluation. A suggestion for the future research is to use A/B-testing as a quantitative evaluation method. This methodology consists of a randomized experiment with two variants, A and B. In this case, one variant could have game elements, and the other could not include any game element. In the case this further evaluation is conducted, it is essential to secure enough time for the testing period and a good way to measure the pro-environmental performance, to properly evaluate the effect.

Another possible limitation is that no inclusion of end customers has been included in the development of the framework. In future studies, it may be of interest to also include interviews, surveys, or other types of data collection from end customers. This could lead to a better understanding of the target group and their motivations.

One of the interesting points raised in this research is that it is still not clear which effect most extrinsic game mechanics have on individuals' intrinsic motivation. More exactly, is still unknown to which extent these features affect motivation, both positively and negatively (Bielik, 2012). Further research is needed, but what is suggested from the available body of research is that extrinsic rewards may have a negative effect on motivation.

To conclude, it is clear that analyzing the impact of the game elements on behavior would be very interesting to expand our knowledge on rebound effects, moral balancing, and other environmental psychology domains which need empirical data to support their theories. In order to justify moral licensing as a driver of indirect rebound effects, future research could perhaps benefit partnering with Seeds to verify if investing in renewable energy can later translate into moral licensing in product and consumption decisions.

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Annex A: Seeds Business Model Canvas

☐ = Investment App Users   ☐ = Community Energy Groups & Project Developers

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
Investor Community	Legal Compliance	Enable regular people to invest in renewable energy	Build a Community	FinTech Investors
Platform Developer	Platform Development	Social Impact	App & Online Support	Environmental Community
Transaction service provider	Data Security	Return on Investment	Virtual Meetings	European
	Project Due Diligence	Investment Carbon Offset Equivalents	Webportal	Project Developers
SEPA Banks	**Key Resources**	Project Finance	**Channels**	Community energy groups
Cyber security	User Data	User Data Analytics	App / Webportal	
Project Developers	IT Infrastructure	Green Marketing	Social media	
	Project Pipeline	User Engagement	Referral Program	

Cost Structure	Revenue Streams	
Legal Advising IT Development Transfer Fees	1€ per month	Project Application Fee
Due Diligence Cloud data service	3-5% of loan	Project Developer Platform Subscription

Annex B: Seeds First Gamification Approach