

The Nexus of Entrepreneurial and Environmental Motivations in Pursuing an Environmental Startup in the High-Tech Industry



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Word count: 26.651

PREFACE

This thesis is the consolidation of my background in innovation management and entrepreneurship and my passion for sustainable development. I am very proud to add to the field of research that I am so passionate about, and that is so needed in current time and age: sustainable entrepreneurship.

In this research I have interviewed people that were inspiring for many reasons, moreover their personal stories are the base for my case study into the motivations for environmental entrepreneurship. I am very grateful for their involvement and most of all wish them all the best in making a positive impact on this planet.

I would also like to thank my supervisor, Sietske Veenman, my fellow students and my mother, for their critical and constructive way of providing feedback – or sometimes for simply making me feel confident in the steps that I took for this research.

Finally, thank you, reader, for being interested in learning more about environmental entrepreneurship. I hope you enjoy reading.

Yvonne Boesten

Nijmegen, August 15, 2018

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Abstract

Technological innovation is needed to address global environmental challenges. Many reasons are holding traditional companies back from disrupting their industries, rather society is increasingly dependent on the initiative of new businesses for innovation and fast implementation of technological inventions. If other companies and institutions want to encourage environmental entrepreneurship they need to know what motivates these prospective entrepreneurs.

This study explores what role entrepreneurial motivations and environmental motivations play in starting an environmental startup, and how they interact. To this end, the research question is as follows: *How are environmental motives interacting with entrepreneurial motives in the process of starting an environmental startup?* The theoretical chapter studies firstly entrepreneurial motivations known for this specific entrepreneurial context: 'creative destruction', 'taking risks' and 'startup life'. And secondly environmental motivations known for this context are studied: 'ethical concern', 'ecological concern' and 'stakeholder action'.

The research question is answered through a qualitative research design: a multiple instrumental case study based on interviews representing different perspectives. The case studies represent the context of an environmental startup in the high-tech sector in Eindhoven, the Netherlands. Both cases have been invested in - and got business coaching - from a startup accelerator called HighTechXL.

The cases that are studied are Applied Biotec and Sustonable. Applied Biotec use a bio chemical process to produce the spicy molecule of a chili pepper without using a single chili. This component can, amongst others, be used in organic pesticides or marine painting. Sustonable is a new generation of composite stone, using recycled PET as a binder instead of the raw material polyester resin. The material is used in kitchen counter tops and is recyclable and stronger than original composite stone.

The units of analysis within the cases are the founders of the startups (four in total) and relevant stakeholders involved in the initial process (three in total). These stakeholders are a mentor from the University for one case and a business coach from HighTechXL represented in both cases. The intention was to interview all founders and relevant involved stakeholders, this research represents seven out of eight desired interviews.

In depth case descriptions are complemented by individual portraits of the respondents, which allowed the researcher to provide a personal point of view in the case studies. The data analysis is executed in Atlas.ti, based on a code book that was created in several iterations by the researcher. This was done by a combination of deductive and inductive coding.

The results show that all respondents were most of all motivated by the opportunity to disrupt a market with a technological innovation. They are driven by excelling the characteristics of their products. It is important that their solution encompasses the characteristics of a sustainable business, because the respondents feel the responsibility to use their capabilities to address societies challenges, directly or indirectly. Moreover, starting an own business allowed the respondents to get out of the limitations of their previous workspace concerning the way of working (corporate) or the possibilities for applied science (academic).

The study did not confirm all aspects expected from theory, the motivation of taking risks was not found in the cases. Unexpected, the study also did not explain the role of stakeholder action in the motivation to start a business, despite the fact that they are both in an industry that would suggest stakeholder involvement. All respondents had a strong focus on market opportunity and possible impact, something that the business coaches indicated as an important selection criterion to work with the startups. A critical note is that the theory turned out to be deficient with respect to the research goal, mainly because it did not allow implicit motivations to be analysed.

This case study showed that entrepreneurs with an engineering background are most of all looking for a way to make their research relevant for society. The researcher suggests to rethink the education of engineers and to support research labs to find relevant applications for their technology research. Also helping prospective entrepreneurs to understand the possible impact of their technology might increase the amount of environmental startups. The research concludes that indeed both environmental and entrepreneurial motivations play a role in starting an environmental startup, with a more explicit role for entrepreneurial motivations and implicit for environmental motivations.

Based on these results, it is suggested to find a way to research the implicit motivations for environmental entrepreneurship. Secondly, to proceed research on the impact of having seen the effects of environmental degradation for environmental entrepreneurs. And finally, to gain further insights on how entrepreneurs constitute their concepts of sustainability and their personal responsibility, and how that is reflected in how they act.

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1 Introduction

In this chapter the research context of environmental action in the private sector will be introduced (paragraph 1.1). This is followed by the research objective (paragraph 1.2) and the research question (paragraph 1.3). Finally, this chapter will describe the scientific and societal relevance of this research paper (paragraph 1.4).

1.1 RESEARCH CONTEXT

Globally public opinion is reaching a consensus on the impact that human activities have on environmental issues, with climate change as an obvious example. In recent years these problems have been institutionalized by, amongst others, the UN Sustainable Development Goals (SDGs) and the UNFCC Paris Agreement (UN-DESA, 2015) (UNFCC, 2018). Interest is growing especially in the role of industry and globalization, who are seen as one of the largest contributors to environmental degradation (UN Global Compact, UN Environment Programme, Oxfam & World Resources Institute, 2011) (Cohen & Winn, 2007) (Hoogendoorn, Guerra, & Van der Zwan, 2015).

The impact of our consumption and production patterns range from depleting our natural resources to producing toxic waste that seriously affect global biodiversity (UN-DESA, 2015). Often valuable resources are wasted due to inefficient production, distribution or consumption methods (UN-DESA, 2015). A topic that get special attention in the Paris Agreement is the reduction of greenhouse gasses (UNFCC, 2018). Traditional ways of producing energy, agriculture and transportation are industries that are known for their greenhouse gas emissions and these gasses have a serious effect on our planet: global warming. This process is already marked as irreversible and has major effects on the climate, with devastating environmental results like the loss of habitable land due to draughts and flooding's (UNFCC, 2018) (Business & Sustainable Development Commission, 2017).

Serious solutions are needed to overcome upcoming challenges, for example to be able to keep feeding all 9 billion mouths that are soon expected to inhabit this planet, or to keep them safe from flooding and draughts, or other consequences of climate change (UN-DESA, 2015). Innovating the energy sector is crucial to at least slow down climate change (UN-DESA, 2015). And how are we going to handle our growing waste and pollution issues? (UN-DESA, 2015)

Yet, nowadays the market is also looked upon as the driver of change in this grand challenge of reversing environmental degradation (Cohen & Winn, 2007) (Dean & McMullen, 2007) (Hoogendoorn, Guerra, & Van der Zwan, 2015). Once small initiatives, like decentralized renewable energy supply, circular material management and bio-based material use, are now rapidly turning into market applications.

Businesses are slowly responding to these global environmental challenges, recognising their impact and their ability to change this impact (Fernando & Xin Wah, 2017) (Hoogendoorn, Guerra, & Van der Zwan, 2015). It seems like momentum is building up, as more and more multinational organizations officially update their responsibilities towards the sustainable development goals. Unilever, managed by

CEO Paul Polman, is a positive example. The company was part of the establishment of the Sustainable Development Goals and puts acts to its words by understanding it also improves their own position *'The Sustainable Living Plan aims not only to reduce Unilever's environmental footprint and increase its "positive social impact", but also to double sales and increase long-term profitability'* (The Economist, 2014). It is crucial that businesses and entrepreneurs start to understand the value of sustainable development for business, and the value of business for sustainable development (Business & Sustainable Development Commission, 2017).

In the field of social sciences this is also described as the concept of 'ecological modernization'; when economy and ecology are equal interests and especially enforcing each other. Disruptive, technological innovation plays a large role in this approach (Janicke & Mol, 2000).

Overall technological innovation is needed to overcome the current situation, yet practice is that many times incumbent firms won't step into the uncertain situation of sustainable business solutions. As York & Venkatamaran state *'there is not only uncertainty around the existence and severity of certain environmental problems, but also uncertainty about the best methods to address these problems and consequences of various solutions'* (2010, p. 452). The ambiguity that comes with this is an unwelcome condition for established firms (York & Venkataraman, 2010), also recognised by the UN Global Compact as an important roadblock for action towards sustainable business within established companies (UN Global Compact, UN Environment Programme, Oxfam & World Resources Institute, 2011). In contrast, new ventures – also known as startups – have less legacy and less stakes to lose, and are therefore able to take higher risks with bigger uncertainty (Dean & McMullen, 2007) (Larson, 2000).

In line with that, global realisation is that nowadays it is not the 'big beating the small' anymore, but rather the 'fast beating the slow'. A research on future existence of the companies on the Fortune500 (Standard & Poors 500 largest companies in the USA, measured by their market capitalization) list shows that 40% of those company will not exist anymore in ten years (Anthony, Viguerie, Schwartz, & Van Landeghem, 2018). Reasons that are given is that they are moving too slow due to resistance to change and transforming issues, making their business vulnerable for new, fast moving and flexible competitors: startups (Anthony, Viguerie, Schwartz, & Van Landeghem, 2018).

Large corporates recognize this threat but also see it as an opportunity and seek ways to invest in, collaborate with or even acquire startups in their interest (Lindgreen, Horn, Bowier, & Beune, 2015). In 2016 in Eindhoven, an alliance was founded to drive the economic development of the area by attracting, supporting and investing in innovative startups in the high-tech field (Brainport Eindhoven, 2016). Members of the startup alliance are companies like Philips, ASML, EY, BOM and ABN AMRO (Van Gool, 2016). The executive partner became HightechXL, who added another purpose: looking for technological innovation with positive impact. This is why HighTechXL tries to only select startups that address global challenges (HighTechXL, 2018). With an emphasis on trying: finding startups that have such a focus specifically on environmental challenges is very difficult (Frericks, personal communication, February 3, 2018).

HighTechXL supports high tech startups in the form of a 'business acceleration program', also called a 'startup accelerator', where the startups join a – pressure

cooker style - three months program of deliverables and coaching, supported by workshops and an expert mentor pool (HighTechXL, 2018). The goal is to turn a technology and a team into a business that is ready for scaling up. This gives the startups the opportunity to speed up their business validation and investor readiness, and this gives HightechXL the opportunity to have a very intensive due diligence period whilst being involved in getting the startups in a better shape (Frericks, 2015). These startups are seen as key players in innovative business for sustainable development, it is important to reveal their motives.

1.2 RESEARCH OBJECTIVE

This research intends to gain insights how someone with the intention to start an environmental business is motivated by entrepreneurship on one side and environmental concern on the other side. The goal is to explore in what way these entrepreneurs are driven by the cause or by the process of their new business.

1.3 RESEARCH QUESTION

The research question is formulated as follows:

How are environmental motives interacting with entrepreneurial motives in the process of starting an environmental startup?

Accompanied by the following sub questions:

How are entrepreneurial motivations influencing the choice to start an environmental startup?

How are environmental motivations influencing the choice to start an environmental startup?

How do these different motivations interact?

The entrepreneurial and environmental motivations are further explained the theoretical framework (chapter 2).

1.4 RELEVANCE

In this paragraph the research is put in perspective of scientific theory development and societal development to understand who or what benefits from this research set-up and results.

1.4.1 Scientific relevance

A business in a startup phase has different priority areas than a further developed medium size or large firm (Hoogendoorn, Guerra, & Van der Zwan, 2015). Meaning that, as Hoogendoorn, Guerra and Van Der Zwan (2015) mention, while a lot of research has been done on environmental practices of large corporates, this knowledge is not directly applicable on small and medium enterprises (SME's). Their research contributed to understanding how involved small businesses are with environmental practices. They distinguish between 'greening processes' and 'greening products and services', which is the difference between practices that are related to production processes or practices related to the products and services they offer (Hoogendoorn, Guerra, & Van der Zwan, 2015). Their research reveals how small and medium enterprises act on environmental degradation, it also links this to four drivers based on stakeholder involvement, but it does not explain personal entrepreneurial reasons these companies had for starting their businesses.

Many studies exist also on the relevance of entrepreneurship in addressing environmental degradation. York & Venkatamaran (2010), Dean & McMullen (2007) and Cohen & Winn (2007) are some examples of researchers that tried to explain the connections between innovation, uncertainty, entrepreneurship, environmental degradation and sustainability.

Dean & McMullen (2007) centred their research around the role of market failures in environmental degradation. They argue that environmental degradation is the result of certain market failures (Dean & McMullen, 2007). On the other side they show that from research on entrepreneurship, it seems that entrepreneurship is the result of reacting on market failures (Dean & McMullen, 2007). In their argument they connect this characteristic of entrepreneurship to environmental degradation.

Cohen & Winn (2007) compliment to this research by identifying the four market imperfections, i.e. inefficient firms, externalities, flawed pricing mechanisms and information asymmetries, that play a role in sustainable entrepreneurship. They see A question that remains for them is *'how sustainable entrepreneurship can provide the creative destruction of unsustainable practices and their replacement with sustainable technologies, business models and lifestyles'*.

Furthermore, York & Venkatamaran (2010) argue how entrepreneurs are able to surpass or supplement efforts by government or companies by addressing environmental uncertainty, provide innovation and increase efficiency in resource distribution. Their focus on innovation is relevant for the context of technology startups.

These studies subjective to environmental entrepreneurship as a solution to environmental degradation all include the role of entrepreneurial opportunity and the capability to respond to that opportunity, two elements of entrepreneurship theorized by Shane & Venkatamaran (2000). A third element of this theory is the role of individual differences and the nature of the opportunity (Shane & Venkatamaran, 2000), which have not been studied yet in the context of environmental entrepreneurship.

This research may contribute to previous research by exploring what meaning entrepreneurs give to their acts on environmental degradation.

1.4.2 Practical relevance

The societal relevance of contributing to the sustainable development goals is known. More specifically, this research may help companies and institutions, like HighTechXL, that support technology startups in any way in understanding how they can motivate them to work on an environmental issue. The results could be valuable in understanding what conditions might be crucial to best support prospective environmental entrepreneurs.

1.5 THESIS OUTLINE

This dissertation consists of a theoretical framework (chapter 2), a method section (chapter 3), two case descriptions (chapter 4 and 5) an analysis section (chapter 5) and ends with a conclusion and discussion (chapter 6).

The theoretical framework starts with explaining the concept of startups, entrepreneurship, environmental entrepreneurship and how motivations play a role in

the process of starting a business. Following this, six motivations have been theorized using relevant, existing theory.

The method section explains why a qualitative method was chosen for this research, and why this is a multiple case study. Next, a first introduction of the cases (two startups: Applied Biotec and Sustonable) is followed by a description of the chosen method of data collection. The chapter ends with an outline of the data analysis strategy. The data will be presented in two chapters, one for each case. Both will consist of a case description and personal portraits of the respondents.

In the analysis the theoretical concepts are used to structurally analyse the data, revealing the motivations for the involved respondents to start their business. These results are used to answer the three sub questions and the main research question in the conclusion. Finally, a critical review on the validity of the results is written in the discussion.

2 Theoretical framework

This chapter will disclose the theoretical foundation of this study. First the relevant concepts 'startups', 'entrepreneurship', 'environmental entrepreneurship' are explained (paragraph 2.1). This is to understand the setting of the research question. The second part continues by theorizing six different motivations for environmental entrepreneurship (paragraph 2.2).

2.1 CONCEPTS

This paragraph starts by explaining the context of startups (paragraph 2.1.1) and continues by focusing on the specific role of an entrepreneur (paragraph 2.1.2) when starting a business. After this the role of environmental degradation in entrepreneurial opportunity is explained (paragraph 2.1.3). This paragraph concludes with a conceptual model in which the influence of personal motivations in starting a new company is theorized.

2.1.1 New venture: a startup

A study by Innosight partners shows that the average lifespan of a company in the S&P 500 index decreased from 33 years in 1964, to 24 years in 2016 to 12 years by 2027, indicating externalities like new technologies and businesses are causing large American companies to be overtaken or to decapitalize (Anthony, Viguerie, Schwartz, & Van Landeghem, 2018). This is also underpinned by the fact that the number of startups (businesses 1 y/o) in the United States exponentially increased from 582,569 in 2011 to 679,072 in 2015 (an increase of 16,5% over 4 years), which is the opposite of the downward trend around the economic crisis from 2005 to 2010 (Bureau of Labor Statistics, 2016).

The definition of a startup is not perfectly set: it is a combination of small size, young age and a steep growth curve (Lim, Kwon, & Hee Lee, 2018). Startups profit from their ability to make fast decisions, yet they do struggle with implementing due to lack of financial resources (Lim, 2018). This is why investors play a big role in the startup ecosystem (Lim, 2018). In return for their 'financial, emotional and technical investment' (Lim, 2018, p. 3) the startups give out shares and thus a share of their potential profit to the investors. The earlier they invest, the more risk they take - something a traditional bank chooses to not play a role in - and the higher the possible return rate generally is. This is due to a final characteristic of startups: the low survival rate (Song, Song, & Parry, 2010).

In the high-tech industry, startups are specifically recognised as the source of new technologies (Lim, 2018). They often emerge as a spin-off of corporate research departments or universities, driven by personal belief of the entrepreneurs involved (Shane & Venkatamaran, 2000; Lim, 2018). York and Venkatamaran (2010) say that *'due to organizational inertia and the inherently contradictory nature of firms producing both harmful products, and environmentally beneficial alternatives, it seems likely that innovations may emerge from new firms'*, explaining how being independent from an incumbent setting seems to be beneficial for the emergence of innovative and possibly disruptive technologies in the environmental sector.

According to Song (2010), this can be generalized to the emergence of technological innovations in all sectors (Song, Song, & Parry, 2010).

2.1.2 Entrepreneurship

Startups are the result of entrepreneurial action, which is described as discovering and evaluating opportunity, as well as creating new opportunities and possibilities (York & Venkataraman, 2010).

However, entrepreneurial action does not implicitly mean the result is a new business yet starting a new business would always be preceded by entrepreneurial action (Shane & Venkataraman, 2000). In this research the focus lies on entrepreneurial action resulting in starting a business, also called a 'startup', the common modus of exploitation of entrepreneurial opportunity (Shane & Venkataraman, 2000).

To understand the process flowing from entrepreneurial opportunity towards the start of a business, Shane and Venkataraman distinguish three conditions within the concept of entrepreneurship: the *existence* of entrepreneurial opportunities, the *discovery* of entrepreneurial opportunities and the *decision to exploit* entrepreneurial opportunities. Later Dean & McMullen (2007) & Cohen & Winn (2007) studied how this is connected to market imperfections (and specifically environmental market imperfections, which is the focus of paragraph 2.1.3).

The existence of entrepreneurial opportunity

The studies by Cohen & Winn (2007) and Dean and McMullen (2007) focus on market imperfections as the source of entrepreneurial opportunity. Market imperfection, or market failure, is a concept related to market theory and describes how market dynamics and individual '*cognitive limits to acquire and absorb information*' (Cohen & Winn, 2007, p. 37) resulting in different relative valuation of such opportunity (Shane & Venkataraman, 2000) prevent a perfect market to exist (Cohen & Winn, 2007). The further away a market is from being balanced, the more dynamic the market is and the more uncertainties occur, which are then ascribed to be 'entrepreneurial opportunities' (Cohen & Winn, 2007, p. 37) (Dean & McMullen, 2007) (Shane & Venkataraman, 2000).

Dean and McMullen (2007, p. 56) elaborate on these two concepts of market dynamics (first theme) and individual competence (second theme) for these market opportunities: '*the first focuses on exogenous shocks which alter either the demand (i.e., tastes and preferences) or supply side (i.e., new product or process technologies) of markets ... the second theme focuses upon asymmetries in awareness to these market changes resulting from individual differences in, for example, knowledge (Hayek, 1945) or alertness (Kirzner, 1973, 1985).*'

The discovery of entrepreneurial opportunity

The discovery of entrepreneurial opportunity depends on the ability to recognise an opportunity, which is the result of experience and knowledge in the field, and the means by which entrepreneurs overcome these market failures (Shane & Venkataraman, 2000).

The duality about the experience and knowledge is that these characteristics are a both a condition for entrepreneurial opportunity to exist (see above), and a

differentiating factor in the discovery of the opportunity. However, the discovery of an entrepreneurial opportunity is not just about recognising the market failure, but also about being able to re-invent the means-end relationship of this situation (Shane & Venkatamaran, 2000).

The decision to exploit market opportunity

Finally, being able to recognize and react to an entrepreneurial opportunity has shown not to be sufficient to explain why it is that some people do exploit the opportunity and others do not (Shane & Venkatamaran, 2000) (Dean & McMullen, 2007) (Cohen & Winn, 2007). Theory distinguishes two factors that influence the *motivation* to finally act on the opportunity: the nature of the opportunity and personal differences (Shane & Venkatamaran, 2000).

The nature of the opportunity describes the perceived possible impact of the solution and is compared to the investment (Shane & Venkatamaran, 2000). This can be an investment of money and time (including non-charged time), but also coping with a high level of uncertainty needs to weigh up to the impact that can be made (Shane & Venkatamaran, 2000).

Even if the expected added value is the same, this does not mean all people will exploit that opportunity (Shane & Venkatamaran, 2000). Shane & Venkatamaran (2000) found multiple dimensions where individual preference plays a role: level of optimism, prior entrepreneurial experience, prior experience towards opportunity, willingness to bear risks and positive framing of risks, higher tolerance for ambiguity, high level of self-efficacy and high need for achievement.

Figure 1 is a visualization of the conceptual model that combines the theoretical insights of Cohen & Winn (2007), Dean & McMullen (2007) and Shane & Venkatamaran (2000).

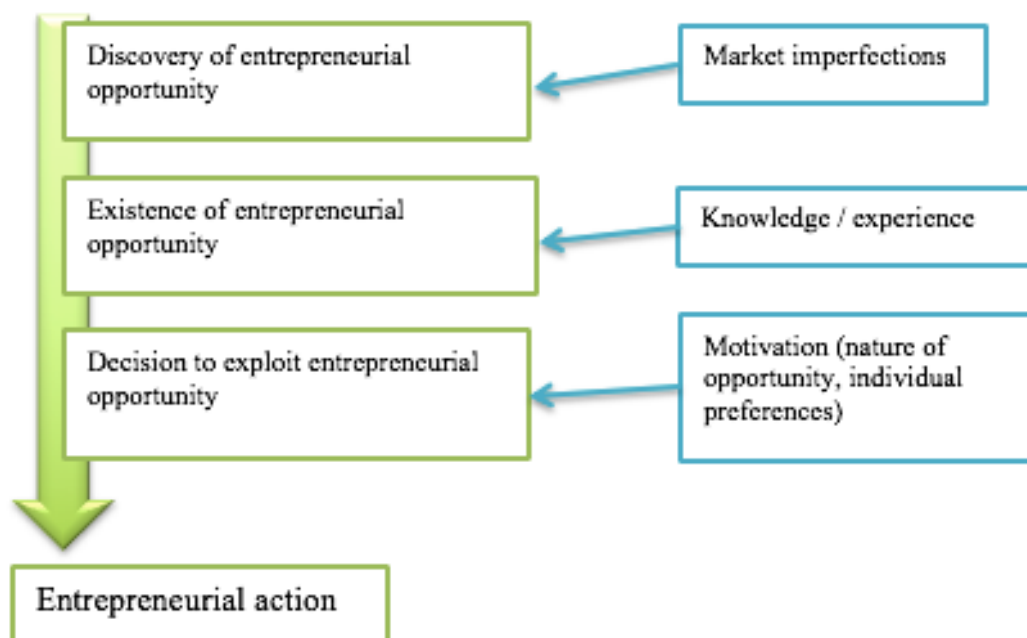


Figure 1: Entrepreneurial action

2.1.3 Environmental entrepreneurship

More to this field of early stage businesses, Dean & McMullen (2007) have been theorising the use of entrepreneurship to solve environmental problems, building a theory on 'sustainable entrepreneurship'. York & Venkataraman (2010) and Cohen & Winn (2007) provide insights and characteristics on the evident connection between entrepreneurship and environmental degradation. Cohen & Winn (2007) argue that this is a two-way connection, where market imperfections cause environmental degradation but also are the result of environmental degradation.

Environmental entrepreneurship has to be read as a subset of sustainable entrepreneurship (Dean & McMullen, 2007). Sustainable entrepreneurship is about entrepreneurial opportunities detracted from sustainability relevant market failures including environmentally relevant ones, where environmental entrepreneurship implies just environmentally relevant market failures (Dean & McMullen, 2007).

York and Venkatamaran (2010, p. 455) also state that '*Sustainable solutions will inherently involve massive innovation and mind-set changes that cannot be anticipated. Entrepreneurs who rely on their beliefs and knowledge to create a different future will be a key element of bringing about the innovations required to address environmental degradation.*' They are emphasizing on the personal aspects of entrepreneurship towards solving environmental degradation and therefor contributing to a sustainable planet (UN-DESA, 2015).

Thus, environmental degradation can be connected to market imperfections as a cause and a result (see arrow 1 and 2 in figure 2). In addition, the value someone appoints to solving environmental degradation, both social and economic, is connected to the persons perception of the nature of the opportunity (see paragraph 2.1.2) (Shane & Venkatamaran, 2000). Someone's knowledge and experience on environmental degradation is a condition for the entrepreneur to discover the environmental entrepreneurial opportunity (see line 3 in figure 2). Finally, environmental degradation and the impact it has on the planet and society can be influencing a person's perception of what is important impact and therefor is shaping the final aspect of personal motivation (see arrow 4 in figure 2).

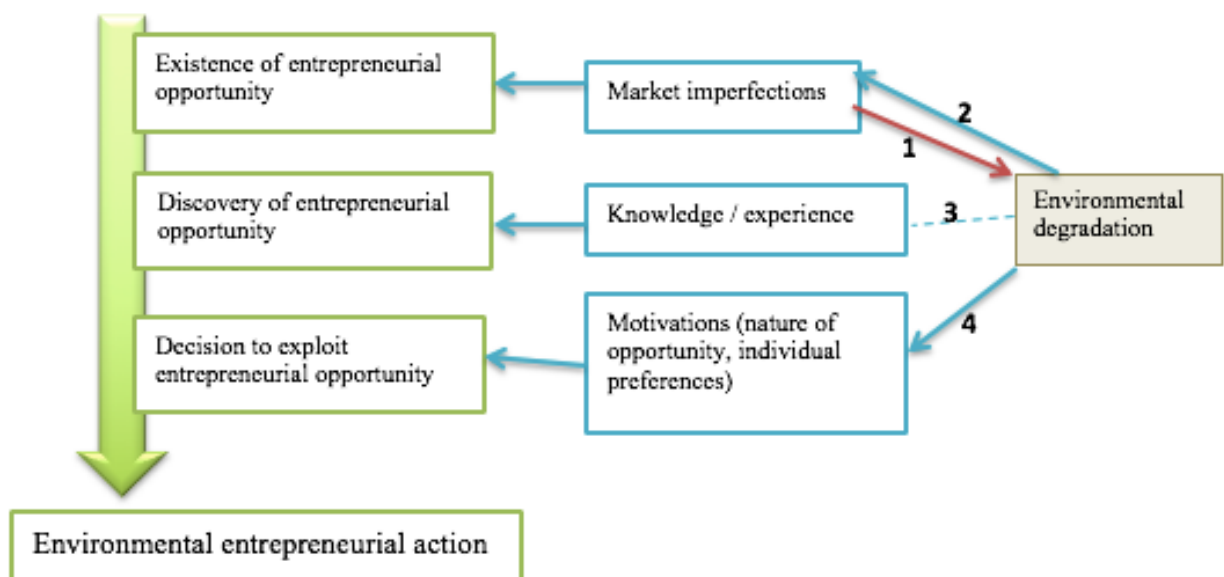


Figure 2: Environmental degradation and entrepreneurial action

This research focuses on the final step of environmental entrepreneurial action: how the decision to *exploit the entrepreneurial opportunity* is influenced by motivations connected to environmental degradation and motivations connected to entrepreneurship, and how these two dimensions interact.

2.2 MOTIVATIONS

The intention of this research is to identify motivations based on entrepreneurship and environmental degradation to understand relationships amongst them. In this paragraph, six motivations for environmental entrepreneurial behaviour are explained, based on the three leading studies by Cohen & Winn (2007), Dean & McMullen (2007) and York & Venkatamaran (2010): creative destruction (paragraph 2.2.1), taking risks (paragraph 2.2.2), startup life (paragraph 2.2.3), ethical concern (paragraph 2.2.4), ecological concern (paragraph 2.2.5) and stakeholder action (paragraph 2.2.6). These motivations are built from the perspective of entrepreneurship (the first three dimensions) and environmental action (the final three dimensions). Every paragraph will be an elaboration on one motivation, working towards a set of indicators for each motivation.

2.2.1 Creative destruction as motivation

According to established research, creative destruction is the process of ‘reforming or revolutionizing industries by exploiting an invention or an untried technological possibility’ (Schumpeter, 1942). Creative destruction can also exist in the form of improving or creating new products or services, information sources and institutions, as well as entire industries, being the basis of not only new business opportunities but also societal change (York & Venkataraman, 2010)(see table 1, indicator 1).

In the light of ‘exploiting an invention or an untried technological possibility’, in the high-tech industry, entrepreneurial action is seen as the result of a pre-market validated trust in new technologies, or as York & Venkatamaran (2010, p. 457) call it *‘the lower the degree of intersubjective trust regarding the ability of an innovation to address environmental degradation and create economic profits, the higher the likelihood the innovation will be brought to market by an entrepreneurial rather than an incumbent firm.’* (see table 1, indicator 2)

Understanding and evaluating a current situation and the implications when interfering in that system can lead to a drive to supplant existing solutions (see table 1, indicator 3) (York & Venkataraman, 2010). In entrepreneurship research previous experiences (could be work, could be any other situation) are considered an important influence on how perceptions are built and thus have an influence on the decision to seize an entrepreneurial opportunity (Shane & Venkatamaran, 2000).

Table 1: Indicators for “Creative destruction as motivation”

Nr	In short	Description
1	New products	The interest in creating new products or services
2	New technologies	A focus on technological innovation
3	Supplant existing products	Dissatisfaction with previous solutions, products and/or services in their field

2.2.2 Taking risks as motivation

New ventures experience low uncertainty perception before realizing there are many uncertainties in later stages (Jiang & Tornikoski, 2018). This lack of perceived uncertainty is connected to acting out of passion (see table 2, indicator 1) (Jiang & Tornikoski, 2018), Shane & Venkatamaran (2000) use the words 'over optimism' with beginning entrepreneurs to describe this. This is a reason why entrepreneurs take more risk than incumbent firms (Jiang & Tornikoski, 2018).

In general, in the debate on climate change and environmental degradation there is a lot of uncertainty on the future state of the planet (York & Venkataraman, 2010). At this point in time, still the issues and their solutions are based on forecasts and beliefs about what will happen in the future (Kluger, 2006), where non-environmental entrepreneurial opportunities might be less uncertain due to some pre-existing indicators. Research has also shown that expert entrepreneurs actually prefer these conditions of uncertainty (Shane & Venkatamaran, 2000) (Dew, Read, Sarasvathy, & Wiltbank, 2008). Also, the concept of 'entrepreneurial rewards' describes how the level of rewards is maximized by the level of uncertainty (York & Venkataraman, 2010). Understanding that uncertainty is the multiplier of residual reward (York & Venkataraman, 2010) (Cohen & Winn, 2007), fits this positive attitude towards uncertainty as well (see table 2, indicator 2).

Due to unanticipated response to their actions in the stage of low perceived risk, the perception of uncertainty starts to evolve (Jiang & Tornikoski, 2018). This occurs by focusing on the state and rightful existence of the business, or on the response effect (Jiang & Tornikoski, 2018). In other words, this distinguishes the uncertainty of the capabilities of the businesses to be able to deliver, and the uncertainty about externalities that have an effect on the business. These unanticipated effects are a resource for business development as well, in other words taking more risks makes a quicker learning curve (see table 2, indicator 3).

Table 2: Indicators for "Taking risks as motivation"

1	Low risk perception	Absence of perception of uncertainties in earliest stage of business, 'blinded' by passion
2	Positive towards uncertainty	Positive attitude towards uncertainty, the actual recognition of uncertainty as an opportunity (entrepreneurial reward)
3	Quick learning	Unanticipated effects exist and are perceived as a resource

2.2.3 Startup life as motivation

Entrepreneurs share certain characteristics that are directing them to work in a startup environment (Shane & Venkatamaran, 2000). In a startup, entrepreneurs act autonomously. In the contrary, when working for an employer (corporate, governmental or institutional) people are less likely to be able to follow their own path, both contextually as planning wise. As a result of acting autonomously, they are being held responsible for the successes and failures of the business. Because of the high levels of uncertainties and risk of failing, entrepreneurs are typically

surrounded by sceptic people (Shane & Venkatamaran, 2000). This explains why researchers argue that entrepreneurs tend to have an internal locus of control (Rather than an external locus of control, which describes when people find that they have no control on anything that happens to them and resonates to a lack of responsibility.), meaning they find that they have ownership or responsibility about activities and choices in their life (see table 3, indicator 1) (Shane & Venkatamaran, 2000).

As most new firms are found in a reaction to a previous situation (for example as part of a firm or university) (Shane & Venkatamaran, 2000), the current situation on itself can also serve as a motivation (York & Venkataraman, 2010). The negative annotation to previous, non-startup, working environment can be an indicator of being motivated by the startup life as such (see table 3, indicator 3).

Table 3: Indicators for “Startup life as motivation”

1	Independency	The need for an independent working environment, internal locus of control
3	Negative towards non-startup life	The dissatisfaction with previous, non-startup, practices

2.2.4 Ethical concern as motivation

As an actor in a society, people have the tendency to do what is good. A direct connection to the community can influence the perception of responsibility for the well-being of this community. The belief that business and society are interwoven is the base of the term ‘corporate social responsibility’ (CSR) (see table 4, indicator 1) (York & Venkataraman, 2010). This can be reflected both in the added value that is delivered by the company, as well as how the companies processes are structured.

The current economic model does not take all externalities into account (Cohen & Winn, 2007). Negative externalities occur *‘when a third party incurs the costs resulting from the production or consumption of products and services, without receiving equivalent benefits’* (Cohen & Winn, 2007, p. 40), more specifically in this case this is concerning negative externalities to the natural environment. When a business does not account for all negative externalities, it could be considered as an immoral act by other individuals or organizations. As a result, research has shown that moral beliefs regarding the legitimacy of existing practices influence the degree of innovation at opposing parties, as well as new firm founding (York & Venkataraman, 2010) (see table 4, indicator 2).

Table 4: Indicators for “Ethical concern as motivation”

1	Social responsibility	Give back to society
2	Legitimacy issues	Will to challenge legitimacy of existing practices

2.2.5 Ecological concern as motivation

When someone is concerned with environmental degradation, this is due to knowledge and experience about the issues and about the implications of environmental degradation for this planet. The awareness that humans are the main influence on global issues, could be considered a condition for this motivation.

This dimension is closely linked to 'ethical concern as motivation' yet differentiates with the actual concern on degradation versus the concern on doing the right thing regarding this degradation. The United Nations (UN) distilled this into 'natural resource management and protection', building on the Brundtland's definition of sustainability (WCED, 1987). The UN extended this with the dimensions of 'economic development' and 'social inclusion' for the creation of the Sustainable Development Goals (UN-DESA, 2015). Typically, ecological concerns are explained by three phenomena.

First, there is the need of mitigating climate change and other environmental degradation caused by human pollution (see table 5, indicator 1). Climate change specifically is mitigated by reducing the emission of greenhouse gasses and increasing the planets capacity to handle the emissions we cannot reduce, for example by reforestation (Trees are known to turn the greenhouse gas CO₂ into the safe gas CO₂) (UN-DESA, 2015). Other pollutions causing our environment to degrade are plastic pollution of our seas and ground pollution by agricultural and industrial activities (UN-DESA, 2015). A solution would be working towards a circular economy, where any outflow of production and consumption would be captured back in the value chain in order to avoid waste (in the form of emission or pollution) (Ellen MacArthur Foundation, 2017).

Secondly, there is adaptation to climate change and other environmental degradation (see table 5, indicator 2). Climate change is happening and it is not only the question of mitigation, but also on how vulnerable geographical areas can become resilient to new climate standards (such as hazards and repeated flooding) (UN Environment, 2018).

Thirdly, there is natural resource scarcity due to climate change and other environmental degradation (see table 5, indicator 3). The way we have exploited, and are exploiting, the planets resources at this stage is causing us to run out of them very soon (WCED, 1987) (Ellen MacArthur Foundation, 2017). Again, the concept of circular economy is introduced on this behalf, to improve material efficiency by keeping it in the value chain after the first use (Ellen MacArthur Foundation, 2017).

Table 5: Indicators for "Ecological concern as motivation"

1	Pollution	Reduce air, water and soil pollution and waste
2	Adaptation	Climate change resilience building
3	Resource efficiency	Resource efficiency measures

2.2.6 Stakeholder action as motivation

Environmental non-governmental organizations (NGOs) and other privately organised actors intent to directly and indirectly influence parties that make immoral decisions, thereby affecting the state of our environment (York & Venkataraman, 2010). Activism can be in the form of direct confrontation or from conscious inaction regarding immoral practices. Action strategies range from provoking governmental intervention, to informing consumers or leveraging CSR strategies of existing firms (York & Venkataraman, 2010).

Activists try to inform citizens and other to make them change behaviour and with that enable change bottom-up (York & Venkataraman, 2010). When an entrepreneur identifies that adaptation of behaviour in time, or when they recognise a change of paradigm, it can be influencing their perception of the impact of the opportunity and influence the decision to act upon (see table 6, indicator 1) (Shane & Venkataraman, 2000).

When activists are pushing for withdrawal of stakeholders from polluting industries, these businesses will start looking for sustainable alternatives in their supply chain (York & Venkataraman, 2010). This might change the entrepreneur's perspective on the uncertainty of stepping into that market with a new venture (see table 6, indicator 2) (York & Venkataraman, 2010).

Finally, when governments take responsibility by intervention and change regulation, this reduces the perception of uncertainty as well (see table 6, indicator 3) (York & Venkataraman, 2010).

Table 6: Indicators for "Stakeholder action as motivation"

1	New information	Change of paradigm in their industry
2	Stakeholder withdrawal	Withdrawal of stakeholders in established situation
3	New regulation	Government involvement in their specific industry

3 Research methodology

This chapter elaborates on the research methodology used to answer the research question. First, the chosen research strategy, a case study, is explained (paragraph 3.1). Next, the selection of the two cases are explained (paragraph 3.2). After this the data collection methods are explained (paragraph 3.3) and finally the data analysis strategy is explained (paragraph 3.4).

3.1 RESEARCH STRATEGY

The research question is leading in choosing a research strategy. In this research, the main question is ***'How are environmental motives interacting with entrepreneurial motives in the process of starting an environmental startup?'*** This research aims for insights on how motives and the process of beginning an environmental startup interact. The strategy is to start gaining understanding of the motives. When the intention of a research is to explore and understand a certain theory in a situation or issue, like this research questions suggests, a qualitative method is used (Creswell, 2013). As opposed to quantitative methods, that are known for its values in proving theory.

This research needs a method that puts value in personal meaning. Creswell (2013) refers to this as one of the characteristics of qualitative research being 'participants meaning', when the researcher is focused on *'learning the meaning that the participants hold about the problem or issue'* (Creswell, 2013, p. 45). Another fitting characteristic of qualitative methods is that of 'holistic account', which is when *'researchers are bound not by tight cause-and-effect relationships among factors, but rather by identifying the complex interactions of factors in any situation'* (Creswell, 2013, p. 46).

Qualitative research is an interpretative research method, focused on interpreting data that is non-determined, like interviews or documents. It can hold different meanings in different perspectives, suggesting that this is not an objective research method. Rather, it suggests that people construct their reality in interaction with others, which is also known as social constructivism (Creswell, 2013, p. 39). Creswell refers to this phenomenon in the role of the researcher as 'reflexivity', which describes that the *'Researcher position themselves in qualitative research studies'* (Creswell, 2013, p. 45).

By interpreting the reasons entrepreneurs have for starting their environmental business, this research is connecting a subjective meaning to a certain behaviour, which will be analysed for patterns and themes (Creswell, 2013). The goal of this research is not to confirm certain theories about why environmental entrepreneurship is relevant and happening, rather these theories are used to explore the entrepreneur's personal valuation of these environmental and entrepreneurial motivations and their influence in the process of starting a business. Since it is close to impossible to find a way to look back in time on an ontological level, the research strategy will not reveal causal relations (Creswell, 2013).

3.1.1 Case study design

In two situations it can be relevant to choose a case study as the research design. When the researcher wants to understand a certain issue or problem, he can conduct an 'instrumental case study' (Yin, 2009), which is the selected choice of

method for this research. This allows the researcher to use a case that has the characteristics of an environmental startup to understand the motivations that played a role in the starting of that business. In the situation when the researcher is looking for a way to illustrate a single case with specific details or interest, it asks for an 'intrinsic case study' (Yin, 2009).

More specifically this is done by a collective case study, or a multiple case study, where the same methodology is used on two different cases in the same context (Yin, 2009). The researcher selects multiple cases (see paragraph 3.2) in the same context and replicates the research method on both cases, this way more perspectives on the are included to illustrate the issue (Yin, 2009). Generalisation is difficult in a case study, yet by narrowing down the context and scaling to two case studies in that context, the results can possibly be used in a broader perspective (Creswell, 2013). Studying two cases instead of one also enhances the reliability of the data (Yin, 2009).

Another, rather practical reason to do a case study is the fact that new, small companies (startups) tend to have a small founding team, which would not be a sufficient number of units of analysis (see paragraph 3.3.1) to collect a valid amount of data to answer the research question (see paragraph 3.3 for details).

3.2 CASE SELECTION

In this paragraph the case context is explained (paragraph 3.2.1), followed by elaborations on why the two startups Applied Biotec (paragraph 3.2.2) and Sustonable (paragraph 3.2.3) have been selected as cases to study in this research.

3.2.1 Context

Because the interest lies in discovering motivations of entrepreneurs, the choice is made to look into businesses that apply the characteristics of environmental entrepreneurship (see paragraph 2.1.3). Especially the motivations of the founder(s) of these businesses are of interest, because they are the entrepreneurs and the initiators of the company. Because some of the motivations might be dependent on actualities, the interest lies in recently started businesses.

Creswell (2013, p. 107) suggests to limit the amount of cases in a study to four or five cases. In this particular study, the choice is to work with two cases that each provide a set of three to four units of analysis (see paragraph 3.3.1). This makes it possible to understand variation in and between the different cases, and at the same time have enough data to recognize patterns over the general context of the cases.

The case selection in a multiple case study is based on the logic of replication rather than sampling logic meaning the cases are chosen so it predicts similar outcomes (Yin, 2009) (Seawright & Gerring, 2008). In this case the selection is based on literal replication, which is when the most similar cases are selected (Seawright & Gerring, 2008). Both cases share the following characteristics:

- They both **contribute to solving an ecological** issue by providing an **IP based technological solution**
- They are **connected to the Dutch market** through their **participation in the HightechXL** (see next topic) **accelerator program**
- Both solutions have been launched not earlier than 2016, they are in the **early stages of their business**

- Both startups **operate internationally**

In the Dutch startup environment the HighTechXL network is a relevant pool for the selection of two cases that operate in a similar context. The fact that the researcher is an employee of HightechXL and the fact that the intention of the research fits the view of the company adds to the reasoning to select cases from this context.

3.2.2 Case 1: Applied Biotec

Applied Biotec is a Mexican startup founded in 2016 by Alejandro Torres Gavilan and his business partner Omar Piña Barazza. The chemical engineers found a way to create the spicy molecules of chilies without using a single chili (Applied Biotec, 2018). It is an organic molecule, yet it did not grow in a field as we are used to and they avoid the toxic fermentation process that is used to extract the molecules. Apart from the apparent use in food, this molecule can be used as an organic pesticide, as a rodent-repellent ingredient for marine painting, it is known as the working part of pepper spray, even applications in the health industry have been investigated (Torres Gavilan, personal communication, April 25, 2018). Currently, the company is exploring the pesticides industry (Applied Biotec, 2018).

The team was part of the HightechXL spring 2018 program. This case is selected because they have a technology based organic replacement for a product and a production process that is known as polluting and resource intensive, which is how they evidently can make a difference in ecological perspective. On top of that, how they chose their market also influences how big their impact is. This is a university spin-off, so it could help understand how an academic background influences the choice to become an environmental entrepreneur.

3.2.3 Case 2: Sustonable

Sustonable is a Spanish-Dutch startup founded by three co-founders. Eric Schoneveld asked Laurens van Graafeiland and Aad van Helden to join him in developing the engineered stone that they later branded and in 2016 launched as 'Sustonable'. They are entering the field of composite stone, but instead of using polyester resin – a side product of raw oil – as glue, they use recycled PET bottles. Their technology enables them to make a product that is better in quality, it is recyclable on itself and it uses only a fraction of the raw materials that the original composite stone manufacturers use. The composite stone is commonly known as material for kitchen countertops, which is the first market the team is focusing on. They are now building a factory in Spain to start scaling up their production.

The team was part of the HightechXL autumn 2016 program. This case is selected because the original, not finished, project emerged from oil refinery Shell (Schoneveld, personal communication, May 16, 2018). Two of the co-founders were part of the original research and decided it was worth following through even if Shell did not continue. This case can help in understanding how a corporate background influences the choice to become an environmental entrepreneur.

3.3 DATA COLLECTION

This paragraph will elaborate on the methods of data collection. First the main data collection method is explained, which is semi-structured interviews (paragraph 3.3.2). This is followed by an overview of who was interviewed and what the reasons for

these interviews were (paragraph 3.3.1). Finally, an overview of supportive data sources is explained (paragraph 3.3.3).

3.3.1 Semi structured interviews

This study looks into personal motivation, which makes the data collection very much focused on the interviews with the respondents. The goal of the interviews is to gain insights in how previous experiences and other influences build up the motivation of a certain involved respondent to begin an environmental business. Motivations can come from many different directions, and might have different weights in a person's perspective. This makes it important that the participant gets an opportunity to express experiences at his own pace and structure (Hunter, 2015). At the same time however, by using a similar topic list in all interviews the researcher ensures all topics are discussed, enabling a more reliable dataset (Hunter, 2015). This is why a semi-structured interview is used to collect the data.

A semi-structured interview is based upon a known set of topics, yet does not use a pre-defined set of questions and answers. Open questions like *'can you tell me what you did before you started company x?'* and *'can you tell me the story of how company x started'*, supported by probing questions like *'why did you leave your previous job?'* and *'why did you chose to work with this technology?'*, make it possible to gather a detailed picture of the respondents personal story around starting that business.

For the interviews an interview guide has been used to increase reliability of the study (see appendix I). An introduction of the research is followed by an explanation of how the data is used and question of consent. After this however, the intention of the guide is to keep track of what has been said rather than to provide questions. The first basic set of questions are used to guide the interview, the questions related to the motivations are only used in case the respondent has a completely different focus. This style of interviewing also enables the respondent to give the researcher a new view on certain topics, outside of the interview guide.

The interviews with the second level of respondents, the mentors, have a similar set-up, yet are more focused on why they have been involving themselves with the startup instead of beginning that startup. In the interview guide (see appendix I) a specific set of questions is made for this group of respondents.

The interviews are recorded and transcribed to enhance the reliability of the data.

3.3.2 Units of analysis

A total of 7 respondents have been interviewed, see table 7 for an overview. For each case multiple perspectives are desired, to allow triangulation in the analysis. Respondents were selected for their perspective (i.e. founder, coach, mentor). The main focus of this research is how entrepreneurs were motivated to start a business with an environmental focus, which is why the core respondents are the founders of the two companies Applied Biotec and Sustonable (see table 7, respondent 1 to 4). This results in a total of four entrepreneurs, because there simply are no other people in that company with similar characteristics.

Using the snowball method in the interviews with the entrepreneurs, other people that played a role in the set-up of the company were looked out for. Interviewing these stakeholders will open up another perspective on the reasons for

being involved in an environmental startup, yet not on a similar level as the co-founders (see table 7, respondent 5).

Finally, for both startups a business coach – or as they internally are called ‘Entrepreneurs in Residence’ – have been interviewed to understand why HightechXL is involved in the startups and how their personal experience with the teams was. Their motivations to be involved with the startups is a representation of the HightechXL values.

The respondents directly connected to the startups have been approached using a ‘snowball effect’: the CEO of the companies have been approached and interviewed first, and they pointed out the other relevant persons in the starting of these company (co-founders and old mentors). The researcher got a referral to the other respondents. The researcher was able to approach the respondents connected to HightechXL personally.

Table 7: Interview respondents

	Name respondent	Role & company	Reasons for interview
1	Dr. Alejandro Torres-Gavilan	Co-founder and CEO at Applied Biotec	The founders of a new environmental company are considered the ‘environmental entrepreneurs’ as described in the literature (chapter 2). These people are the initiators of the companies, put the most effort in it – have the highest involvement – and typically take the most risk to pursue the company’s existence.
2	Omar Piña Barraza	Co-founder and COO at Applied Biotec	
3	Erik Schoneveld	Co-founder and executive director (technology) at Sustonable	
4	Laurens van Graafeiland	Co-founder and executive director (sales and business development) at Sustonable	
5	Dr. Agustin Lopez Munguia	Professor and lab director in bio technology at National Autonomous University of Mexico	Co-inventor of the technology, has been hosting Applied Biotec for free at the research laboratory and the University is licensing the patents to Applied Biotec. Considered a mentor for Torres-Gavilan.
7	Dr. Martijn Rutten	Entrepreneur in Residence at HightechXL, CTO at Othera	Is involved in the selection of the startups for HightechXL programs and as a business coach for the startups, in this case specifically interviewed for his involvement with Applied Biotec.
8	Erik Broekhuizen	Program director and Entrepreneur in Residence at HightechXL	Is involved in the selection of the startups for HightechXL programs and as a business coach for the startups, in this case specifically interviewed for his involvement with Sustonable.

3.3.3 Other sources

In a case study it is important to understand the specific details of the case. By triangulating different sources, it is possible to compare different (personal or company) statements (Creswell, 2013). Especially for the case description, using different sources enriches the storyline of both cases. The different sources have been used for different purposes (see table 8) and were made available by HightechXL and both companies.

A one-pager is considered a business to business or business to investor flyer, short listing the value proposition, next steps and needs of the startup. An investor deck is considered a visual snapshot of the business plan, used to explain all aspects of a business for sales and investment activities.

Table 8: Data sources and reasons to use them

	Kind of source	Origination	Why is it relevant?
1	One-pager	Applied Biotec	Used for the case description, to understand how the startups communicate their unique proposition, to understand what they communicate as reasons for the existence of their company
2	One-pager	Sustorable	
3	Investor deck	Applied Biotec	
4	Investor deck	Sustorable	
5	Shareholders overview	Applied Biotec, HTXL database	To understand the division of shares for Applied Biotec
6	LinkedIn	Eric van Broekhuizen, Laurens van Graafeiland	To fill some factual gaps that have not been answered in the interviews.
7	Website	Sustorable	Used to understand outward communication, used in case description

3.4 RESULTS AND DATA ANALYSIS STRATEGY

This paragraph will explain how the data that was collected is analysed. First, the presentation of the results is explained, which is in the form of a case description and written personal portraits (paragraph 3.4.1). After this the data analysis strategy is explained (3.4.2).

3.4.1 Presentation of results

A crucial part of a case study is the detailed and extensive case description (Creswell, 2013, p. 130), which will provide insight in the company and the chronology of how the team started the business. Yet, this would not enable the analysis of personal motivations that are outside the scope of the startup. This is why the case description will be accomplished by personal portraits of the respondents, build around the motivations that drive the respondents in their choices – in case study research this is also known as describing the setting (Creswell, 2013, p. 130).

The analysis of the data begins already when writing the case description and carefully constituting the portraits of the respondents (Yin, 2009). The role of the researcher is to filter out information that is important for the research question to be answered, which is why this can be considered part of the analysis already. In this step, the researcher does not consider the different concepts that were explored in the theoretical framework. The portraits are purely descriptive and made to understand motivations of different respondents, without valuating, weighing and linking the motivations to others.

3.4.2 Data analysis

The next step in analyzing is to understand the meaning and influence of these motivations and to recognize possible themes and patterns, which is a characteristic for qualitative data analysis (Creswell, 2013, p. 130). The process of categorization is called coding, a quintessential part of qualitative research. Organizing the data using codes also helps in making the research process more transparent and therefore more reliable (Creswell, 2013).

Different ways of coding exist, ranging from pre-figured to emergent codes, where the difference lies in how much the researcher is pre-structuring the coding process (Crabtree & Miller, 1992). This is also known as the difference between deductive (starting with theory) and inductive (emerging from empirical data) research. Creswell (2013) suggests that if the researcher uses pre-figured codes based on theory, to also be open to emergent codes. Because respondents might bring up new, relevant topics regarding their motivations to start a business, the choice is to work with a combination of deductive and inductive coding.

To guide this process, the six motivations that have been presented in the theoretical framework (see chapter 2) will be used as code families and their indicators as the subfamilies (see appendix II). The coding of the information happens from two directions. The theoretical codes will be used to make a first categorization, in parallel new codes that do not fit any of those categories are allowed to emerge. In a reviewing process, the original categorization will be critically looked over and new codes will be created to include separate coding in the families and to split up (sub)families if needed. Information that is useful in the case descriptions of both cases are connected to three new families.

Double meaning in quotations and the way the subfamily is formulated may connect a subfamily to two families, which is why – if applicable – a secondary family is put behind in brackets.

Following Creswell (2013) in his analysis strategy, this research is not reporting on the count of coding, rather the amount of occurrence of a certain coding and corresponding quotations is in some moments used as an *'indicator of the participants interest'* (p. 123).

The coding program Atlas.ti was used to analyze the transcriptions. An advantage of using such an enhanced program is the ability to structurally store and analyze all data in one project (transcriptions, visuals and documents) (Creswell, 2013). It also encourages the researcher to meticulously read and give meaning to every sentence or idea. In this case this specific advantage is used to ease the review of coding, as the analysis strategy requires.

4 Applied Biotec Case

In this chapter starts with an in-depth description of how Applied Biotec came to existence, including a detailed description of their solution. After the case description, four written portraits of Alejandro Torres Gavilan, Omar Piña Barraza, Agustín Lopez-Munguia and Martijn Rutten are composed to understand the personal motivations that played a role in the becoming of the startup Applied Biotec.

‘We provide eco-friendly solutions to traditional alternatives that have been damaging the world.’ - Torres Gavilan, personal communication, April 25, 2018

‘Biotechnology... to solve environmental and health problems.’ - Piña Barraza, personal communication, May 17, 2018

‘I think that in a country like Mexico, a research institute like ours has an obligation to participate in the creation of knowledge and the creation of industry and also in the solution to specific problems, using knowledge. Using in this particular case bio technology.’ - Lopez-Munguia, personal

4.1 CASE DESCRIPTION

The name of this company (‘Applied Biotec’) already reveals the core activity of the company: finding *applications* for *biotechnology* solutions. Alejandro Torres Gavilan and Omar Piña Barraza founded the company in 2017 in Mexico City to ‘*become the leading reference in developing sustainable and innovative bio-based solutions for health and environment by 2050*’ (Applied Biotec, 2018). Specifically, right now the business is producing the spicy molecule of chilies as a base for organic, sustainable pesticides.

This case description contains an elaboration on the product and why it is relevant, the roadmap of the company from technology research to market launch and some practical information on the company structure.

4.1.1 Capsaicin

Their first solution is a ‘*green biotech process*’ to ‘*produce the spicy molecules (capsaicin) from peppers*’ (Applied Biotec, 2018, p. 3) (Castillo, Torres Gavilan, Severiano, Arturo, & Lopez-Munguia, 2007) and that is unique because with their synthesising process they do not use a single chilli pepper to do so. This means no land or water (and pesticides) is needed in production and neither the environment nor factory workers get in touch with the original toxic process of extracting the spicy compound from the chilies (Applied Biotec, 2018, p. 6). Next to that, the process delivers a pure (100%) compound, where extracts have a 10% rate of the spicy molecules, and the time and price of delivery go down as well (Applied Biotec, 2018, p. 6).

Multiple application areas could benefit from this spicy molecule. The molecule has proven it could work as part of a true organic, bee and human friendly crop protection (pesticide), as a rodent-repellent coating for cables and as an antifouling component of marine paints. On top of that research shows the molecule could work in neuropathic pain and obesity control, two high opportunity markets as well (Applied Biotec, 2018, p. 13).

Currently Torres Gavilan and Piña Barraza are validating the organic pesticides market and are doing early validation in the marine painting industry (Rutten, personal communication, July 10, 2018). Because there are so many application areas, they are quite confident they will hit a breakthrough, about this Piña Barraza said *'...and if this is not successful it's going to be successful in another way. Maybe with another product, but with capsaicin... I'm sure we have a business'* (Piña Barraza, personal communication, May 17, 2018).

Compared to other pesticides, organic pesticides have positive characteristics like being bee friendly, as well as being non-toxic for other repellents and animals, because the spicy molecules *'scare instead of kill'* (Torres Gavilan & Piña Barraza, Applied Biotec XLDAY pitch, 2018). Yet the paradox in the organic pesticides market is that they are actually being produced using toxic pesticides, and an abundance of land and water, which is why Applied Biotec is also replacing a polluting and resource intensive process.

Piña Barraza and Torres Gavilan see that the market of biopesticides is growing three times as fast as the 'toxic pesticides' market (Torres Gavilan & Piña Barraza, Applied Biotec XLDAY pitch, 2018). The global market of pesticides is valued at \$65 billion, mainly consisting of a small number of very large players (Applied Biotec, 2018). The company is validating a business model where they would supply the active ingredient to the established pesticide producers, both aiming for the bio and non-bio pesticides producers (Applied Biotec, 2018, p. 7).

4.1.2 The roadmap to Applied Biotec

The first steps towards this business were made at the National Autonomous University of Mexico (UNAM) at the faculty of biotechnology. Mexican professor dr. Agustin Lopez-Munguia was researching a biochemical process that was using enzymes to extract yellow colorants from marigold flowers (Danielski, et al., 2007)(Lopez-Munguia, personal communication May 21, 2018). He was doing this for a company that was used to extract this oleoresin by fermenting the flowers in the field, with soil pollution and stinky odor as a result (Lopez-Munguia, personal communication May 21, 2018).

In his intention to replace the polluting fermenting processes of extracting the flowers' colorant, he discovered a similar problem on the same plant, but for chilies (Lopez-Munguia, personal communication May 21, 2018). Low quality chilies that were not used for the food industry, were used to extract another oleoresin, capsaicin, that has multiple interesting applications in industry (Lopez-Munguia, personal communication May 21, 2018). However, this extracting process was toxic for factory workers as well (Lopez-Munguia, personal communication May 21, 2018).

In this time, 'synthesizing with enzymes' was a research line that got much attention worldwide (Lopez-Munguia, personal communication May 21, 2018). It turns the process around by using enzymes to build up the right molecules, the amides of the chili, without using a single chili. This is when Torres Gavilan joined the

lab and started to work in the project from the beginning (Lopez-Munguia, personal communication May 21, 2018).

Torres Gavilan joined the lab and successfully devoted his master thesis to this research (in 2009), followed by a PHD research (Torres Gavilan, personal communication, April 25, 2018). Torres Gavilan and Lopez-Munguia published several papers on the technology (Lopez-Munguia, personal communication May 21, 2018) (Castillo, Torres Gavilan, Severiano, Arturo, & Lopez-Munguia, 2007) (Regla, et al., 2008). Torres Gavilan pursued to do two post-doctoral researches on another subject, while in his own time researching scaling opportunities for their technology (between 2009 and 2015). As Lopez-Munguia said *'we kept making experiments but not really involved full time in the idea of scaling up the project. So, it was not until we got some money from the government that we joined with this industry to explore the scaling up of the project. But fortunately for us, it was Alejandro (Torres) himself who got involved in the scaling up of the project'* (Lopez-Munguia, personal communication May 21, 2018). He also discovered many existing applications for the spicy chili molecules and recognized the opportunity in being able to produce those molecules without using any chilies: *'we can provide material for those applications if this technology is commercially validated'* (Torres Gavilan, personal communication, April 25, 2018).

Finally, in 2016 Torres Gavilan and Lopez-Munguia got the technology patented (Mexico Patentnr. WO/2016/171538, 2016). Still partially working for the University, Torres Gavilan joined a company that was interested in starting a business around this technology, but quickly departed from this route, because according to Agustin *'soon, like a year, they (the company) realized this was not an easy task. I mean it was not just start producing and getting money, and that's one of the main difficulties that we found in some of the people from industry in Mexico: they always want results in the short term and they don't take many risks'* (Lopez-Munguia, personal communication May 21, 2018).

While working with this company, Torres Gavilan also joined an office that helps ideas become a business reality, an 'incubator' called Inno-Ba¹. This is where Torres Gavilan met Piña Barraza for the second time in his life and they became friends (Piña Barraza, personal communication, May 17, 2018). This incubator was focused on innovation management and *'dealing with the technology transfer between private sector and public sector'* (Torres Gavilan, personal communication, April 25, 2018). Piña Barraza was working here as a technology and innovation expert, helping projects to find valid market opportunities (Piña Barraza, personal communication, May 17, 2018).

After some time, in 2017, Torres Gavilan decided to separate his business from the incubator office as well, since that did not work out (Torres Gavilan, personal communication, April 25, 2018) (Lopez-Munguia, personal communication May 21, 2018). When he was looking for someone to work together with, Piña Barraza joined him as a founding partner (Torres Gavilan, personal communication, April 25, 2018). Piña Barraza quitted his job at the incubator and they founded the new company 'Applied Biotec' together, with the continuous mentoring of their professors and

¹ An incubator in this context is a center where entrepreneurs get the opportunity to turn ideas into a business case. In this incubator the focus was on 'creating links between company and academia, in order to exploit and commercialize technological inventions, for the generation of new products, processes or services.' (Linkedin, J. Mancilla Ocampo, July 23, 2018)

colleagues from university (Torres Gavilan, personal communication, April 25, 2018) (Lopez-Munguia, personal communication May 21, 2018). The latter not only because the company has a license contract with the university for making use of the patent, but especially the idea that *'entrepreneurship is the solution to a very conservative industry in Mexico'* and that *'they are betting their professional life to this... at least for the moment... to this activity'* makes that Lopez-Munguia sees the support of these two entrepreneurs as evident (Lopez-Munguia, personal communication May 21, 2018).

After having some experience with the pesticides market in Mexico, the team decided to explore the market of marine painting in Europe. This is when the two entrepreneurs joined the Dutch startup accelerator HightechXL. This is a three months in-house program where a team of experts in business model design and validation and investing helps them accelerate the process of business development and getting them ready for investors and market launch. The team got selected for the program running from April 2018 to July 2018. Practically this means that they now have a Dutch company base as well and are able to expand in the European market (Applied Biotec, 2018).

4.1.3 Company structure

Co-founders Torres Gavilan and Piña Barraza are both actively involved in Applied Biotec. Next to that they have one employee, Esmaralda Ramirez, she works with the team in the different projects (Applied Biotec, 2018, p. 16). In April 2018 the team joined the HightechXL accelerator which temporarily meant the involvement of business experts and acceleration experts from HightechXL. In July 2018 they finished the program and HightechXL and Applied Biotec continue their collaboration as shareholders and with continuous accelerator alumni coaching.

Torres Gavilan and Piña Barraza shared equity before they joined the HightechXL accelerator. Now the three parties share equity, the percentages are reflecting the involvement of the parties. Torres Gavilan is CEO and fully committed, he is co-inventor of the intellectual property and has the most technological insight in the product (Applied Biotec, 2018)(Piña Barraza, personal communication, May 17, 2018) (Castillo, Torres Gavilan, Severiano, Arturo, & Lopez-Munguia, 2007). He owns 55,2% of the shares (Applied Biotec, 2018). Piña Barraza is the second co-founder, mostly responsible for business development and project management (Piña Barraza, personal communication, May 17, 2018). He is part-time involved; up until now he has been doing some short-term consultancy assignments, from which the earnings enable him to have a less secure role (and salary) at Applied Biotec (Piña Barraza, personal communication, May 17, 2018). He owns 36,8% of the shares (Applied Biotec, 2018).

Finally, HightechXL owns 8% of the shares (Applied Biotec, 2018). HightechXL is a startup accelerator in Eindhoven, the Netherlands, focused on high-tech startups. In exchange for 8% equity, startups join the HightechXL program to accelerate their launch to market [BRON].

The company is established in Mexico-City, recently they established a Dutch private company (BV) as well, to be able to start operations in the Netherlands and Europe as well, which in accordance to the participation of the HTXL accelerator as well.

4.2 PORTRAITS OF ENVIRONMENTAL ENTREPRENEURSHIP

The following portraits are meant to give an overview of the personal motivations throughout the process of establishing Applied Biotec. The insights are all coming from dedicated interviews, if other it is mentioned.

4.2.1 Portrait Dr. Alejandro Torres Gavilan

After a bachelor degree in chemical engineering, followed by a master degree and a PHD in biotechnology and two post doc researches in the same field, Alejandro found himself questioning the added value of his scientific work *'so, I've asked myself what's the case of doing research if it's not going to be applied to our normal life?'* He felt like the academy is not giving him an option to develop himself professionally.

'(in) Mexico the research that's being done is only for publications and for making patents without use' and 'In Mexico, you don't have a time to go, like retire. So many old people are staying in the university to have a salary and there are not enough vacancies for young students and PHD graduates to become professors or to have a level authority.'

Alejandro also knew he did not want to be part of a large company, even before he started his master.

'I don't want to be in a desk, I don't want to be in charge of a production line for Coca Cola, Pepsico, whatever. These options were available in Mexico... so I decided to make a master degree' and that he does not want to 'be imposed by a corporate idea of okay you have to deliver quality control daily and this has to be 80% no byproducts and bla bla bla; and to be attached to it. I rather be in a more creative area of okay how do we deal with this problem.'

He concludes that being in a startup allows the team to make decisions based upon discussions, to experiment with the option of going outside the box and being wrong and to work on innovative solutions. Because he has more responsibility in his role as the CEO of a startup, he learns a lot in a very short period of time. Yet he also sees a disadvantage in not being part of the corporate, by for example not having the same tools and resources. On the positive side, the final reward can be way bigger *'if the startup is successful, yes'*. The uncertainty that comes with this, is more and more a concern for Alejandro.

'the risk when I took the decision to become an entrepreneur, felt much lower than the risk than I now feel of being an entrepreneur [...] it might be that when you started if it fails soon than I can do anything else, right? I can do - I can come back to the university or I can search for another job [...] as the time passes, you're attached to your startup and you start to love it like a baby, so you don't want to lose your startup'

Alejandro's perspective on life changed completely when he got children and this experience also put more weight on his general feeling for social responsibility.

'well... it's a complete change of 180 degrees [...] you have to response for a creature or a person that you're responsible for. So, if you don't do things that might help them to become a better person than, or how can I say... to become a better person or to have a place to live, right? And if we continue damaging the world, then they won't have a place to live'... 'it has become more into my veins'.

Being a newcomer in the pesticides industry, Alejandro found himself learning a lot when diving into the market. Four times, but in different wording, he refers to this learning process, one example being *'And as long as I continued to investigate the damages of pesticides than I came more aware of that something has to be done.'*

He says first *'the problem was far away from my understanding'* but then he started seeing many issues in this industry, both ethically and ecologically, making him understand how their technology could improve people's life in the first place: *'People in Mexico that may fall dead because of the chemical compounds they are spreading into the cultures, not just by meaning I am eating this tomato that has pesticides and I could be dead for eating this pesticide, but also for the people that is spreading the pesticides in the crops'*

Which is also illustrating the multidimensional impact that the present pesticides have on people. Also, for the long run he expresses his concerns on the effect of the toxic pesticides on new born babies. He specifically mentions the ignorance of the companies that are involved and later seriously challenges the legitimacy of large players in this industry. When answering the question if toxic pesticides are a problem in Mexico he answers

'Well, not for the companies that are selling the pesticides.' '... for instance, Bayer and Monsanto and Syngenta and those big corporates claim that they have a mission for 2050 that it's a - they have to take action, replacing pesticides, and that they are doing everything they can do so, however they are not uncomfortable on selling million tons of [...] the chemical toxic pesticides.'

Having a positive impact on society also comes back when he discusses why he did not pursue the giant opportunity in the defense market, where the chili molecule is used in pepper spray *'I don't want this technology to be used to control humans [...] and the reason why is because I believe that the main thing to control humans is with reasoning and understanding of each other'*. His broader vision is to use biotechnology to make eco-friendly solutions for all polluting industries, referring to those as *'... traditional alternatives that have been damaging the world'* and *'... other industries that contaminate a lot.'*

4.2.2 Portrait Omar Piña Barraza

After a bachelor in chemical engineering, Omar pursued a master in biotechnology focused on using proteins to design new pharmaceuticals. After obtaining his master degree, Omar started as an innovation manager at the Inno-Ba center for the development of innovation and technology transfer (Linkedin, Piña Barraza, July 23, 2018). He left science because he wanted to make impact in society and saw that this involves more than just research.

‘There are some people that are making science, that are creating and discovering things, and there are people that can help take this knowledge to generate an impact to the society in a shorter time [...] you need the two elements to generate an impact and I like this part [...] more than to be part of just generating knowledge.’

Two important elements of his new employer were working with academic research and working with sustainable projects. For Omar, innovation was a critical part of his motivation for this job, which he shows by putting the words it in the following order: *‘Innovation project management, with a tendency, with a philosophy in projects that were concerning sustainable development’*. When Omar was looking for a job, he specifically focused on the technological opportunities. Yet, after he started working for the company, he got inspired by the broader vision of the company to work with sustainable projects.

When Omar was young, access to internet opened his mind about political, social and environmental topics that he did not learn before. *‘The internet makes a change for me. The information that was now in front of me starts to change a little... or too much.* One of the things he learned as a child was how polluting the animal industry was, which resulted in making the decision to eat vegetarian from that moment onwards. *‘That was a concern that just went very deep in me [...] then I took the decision to be vegetarian, a political decision to demonstrate that I was against that kind of industry’.*

However, at this point in life he separates the concern for environmental issues in his private life from professional decisions, where the technological focus is very clear. Being involved in obtaining government funds for companies taught him a lot more about the state of politics and economy in Mexico.

‘Almost all the companies that were obtaining the money of the funds weren’t technological companies. That were big companies that already have money and just were taking advantage of the funds [...] They were taking advantage because they knew the ecosystem, they knew the government funds and the people that are not involved in the ecosystem don’t know nothing about that.’

Inequality is a reoccurring topic for Omar. Corruption is a big problem in Mexico and affects the environmental and social state of the country deeply, making Omar *‘feel hungry’* for change. Industries like mining are polluting entire rivers including populations living around them, due to bad regulation and a lack of social responsibility of large (inter) national companies and a corrupted government *‘I think if you don’t have a government that’s concerned about that, every company is going to - well not every company – but too much companies are going to take advantage*

or make money' ... 'like the pollution of rivers: if you study that case, you can see that all that happened because of corruption.'

Omar develops a strong focus on improving the economy and politics of Mexico, by means of creating his own knowledge-based company.

'One of the characteristics of the economy in Mexico is that there aren't too much companies that are creating high value through the knowledge. The knowledge and the technological area I think it can create, or it can impulse, or boost a better economy.' ... 'I think we can create better jobs than the traditional companies, and we have to develop the consistent innovation ecosystem in Morelos, that is the region we live'

He realizes that if he adds value to the market, there is a bigger chance of being involved in important political decisions to make an even bigger impact.

'And if we create something important we have the leverage, the opportunity and the contacts to generate more impact in other topics: in public policy and some things like that. And I think it's important to canalize our knowledge and our ambitions to make a better - not only environment - make a better ecosystem to live there.'

Meanwhile his job at Inno-Ba taught him many skills outside the scope of science and more about entrepreneurship and business development *'I already knew how to make projects, how to obtain funds... and I say if I can do that for other persons, I can do that for my own projects. That was the only thing: I just wanted to create my own things.'* At the same time, it was a very demanding job.

Creating his own things would be a big step, since as a child Omar was not likely to become an entrepreneur. Not until five years ago he realized this could be something for him too. Next to working as a consultant and innovation manager, he became a partner for a starting company focused on pharmaceutical development. Yet, this did not satisfy his growing environmental concern *'The other thing that we are doing in that company is biotechnology - that does not generate pollution - but also you're not solving environmental things. You're solving just health problems.'*

Then, when Omar befriended Alejandro when they met in the incubator, technology and sustainability – and private life concerns and professional life concerns - all came together for Omar. Omar was not directly involved in the project of Alejandro, but as friends they started discussing the opportunities for collaborating. Omar was interested in Alejandro's technology and they realized together *'they had the right capabilities to start something well'*. For Omar, the timelines of discussing with Alejandro and quitting his job at the incubator are crossing each other. What is certain is that he got convinced when they managed to state their company's vision in a way that it transcended the use of just the capsaicin technology into a broader perspective: *'And we decide our first project is going to be this one (capsaicin). But the company had the philosophy to look for and develop projects with these characteristics: [...] Biotechnology ... to solve environmental and health problems.'* At this point, the patent application and the process so far only demonstrated a market opportunity and the technical feasibility, but it was not commercially validated *'... we*

only know that it would be an interesting opportunity, but we did have the secure of nothing.'

He knew the risks involved, yet, this was enough for Omar to be convinced to take the next step; actually, the fact that there still was some important market validation work to be done triggered Omar even more: *'I like to search things, to look things, to validate hypotheses... for me it's fun! [laughs] if I have time I can do it just forever.'*

He feels comfortable with the insecurity of income, because he has the possibility to do short term consultancy jobs in between to be able to continue with Applied Biotec. The positive side of this freedom is even more important to him: *'I think the most important thing in this, to be an entrepreneur, is to feel that freedom to do things [...] to take decisions, to take your own way, to decide about your time, where you can canalize your time, it's very important. Now we can decide: let's go just to focus in this topic, in this industry...'*

And for Omar, solving environmental issues now became an imperative part of the decisions he makes, and how everyone else should make them: *'It's simply what we have to do. Everything has to do something for the environment, because it is the problem of everything.'*

4.2.3 Stakeholder perspective: portrait Prof. Dr. Agustin Lopez-Munguia

Next to being a professor in biotechnology, Agustin runs an academic laboratory in enzyme technology. In this role, he measures the labs successes by how their research groups are connected to industry. A basic aspect of biotechnology, he feels, is that its research is evidently connected to industrial applications. In this spirit, he shares many stories of how his lab was involved with industry. Reasons for these researches mostly are to improve certain processes for health reasons, pollution issues or the search for a less resource intense process. The fact that they work with residues (waste improvement) and researching alternative technologies, makes that evident connection according to Agustin *'it is very difficult to find a biotechnological application which is bad for the environment. Most of the projects that we are dealing with at the institute, have that component included.'* Yet, this is not a main driver for Agustin, instead the technological innovation is: *'I have to be honest that this is not in the first line of the project [...] this is a molecule with a lot of applications and a lot of properties, so that's what we put in front of the... at least that is what I put in front of the advertisement'*

It was not just the environmental issues that triggered Agustin in pursuing research on the capsaicin topic, but especially the technological breakthrough that they anticipated motivated him to drive the research with Alejandro. Many times, Agustin is eager to elaborate on the technical details and innovativeness of their research, for example: *'He (Alejandro) was really very excited with the results and all the varieties of compounds that we could synthesize, specifically capsaicin, because capsaicin already has a market and so we asked for a patent, we published several papers and he did a post doc also in modeling of enzymes'*. This is a typical example of what Agustin sees happening in their way of doing research: on the one hand looking what is being done in the world in their field of research and combine that to what is around in practical issues to solve.

Yet after many failed attempts to market the capsaicin technology, he does see that entrepreneurship is the only way to make it happen, since you need to be outside of the university's regulations and away from corporate pace. He also sees that their researches many times fail to combine both technical feasibility and economic feasibility *'That's one of the main difficulties that we found in some of the people from industry in Mexico; they always want results in the short term and they don't take many risks.'*

For Agustin personally, the laboratories projects feel like 'many different adventures', that he enjoys so much that he does not feel the urge to join the projects in a more focused, entrepreneurial way, like in the capsaicin project: *'I have a lab, I have many students, I have many projects, some of the projects related with the industry [...] But as an individual I don't want to get involved for many reasons, because I think it's, you know, I wouldn't like to concentrate on this specific project.'*

Whilst he did not join Alejandro and Omar in founding the company, he does have some stakes in the company's success that make him stay involved. The licensing contract the company has with the university make that they benefit more when the company has more success, which is a recurring topic for Agustin. *'They will have to pay royalties to the university so I will benefit, my lab will benefit [...] So, the larger the markets, the better for us.'* Agustin is not actively involved in the company's strategy, without regret because he trusts all choices Alejandro and Omar make as entrepreneurs.

'But fortunately for us, it was Alejandro himself who got involved in the scaling up of the project' ... 'They are two young entrepreneurs making an extraordinary effort to bring this idea to reality. So, I'm very very fond of that' ... 'The characters themselves: they are very enthusiastic and ready to innovate. They know that what they have in their hands is something that can grow [...] they know the environment in Mexico' ... 'Really we share good moments and we understand very much each other and I think that we both share the same values, which is the most important thing in a relationship.'

This even makes him go outside the books to support the company, by offering them free access to the laboratory even though the company is not owned by the university. For Agustin this is nothing different from a long-term investment, because he believes that the company does not stand a chance if they would have to pay commercial rates for all the services he offers them for free.

'If this comes out at the official level, I'm probably in fault. Probably I should be making this a formal relation, and it will be, but they are just creating the company and starting... they have nothing, they have not industrial facilities, they have no labs... they just have the idea that came from my lab, trying to make it successful... so I feel like an obligation to support them' ... 'I know Alejandro, and I'm sure that this is something that if it's successful, it will be the beginning of an industrial-academy relation for very very much more than just the synthesis of this compound'

The fact that Alejandro and Omar are applying biotechnology from Agustins lab to a market, makes him prouder than any other aspect of his job. Both from a personal perspective as from a broader social perspective.

'As a researcher I of course get a lot of satisfaction from my publications, more satisfaction from my students [...] but the idea of having something that was created in my lab, that was part of a student formation... now becoming a something applied is something that would be you say the cherry of the cake in my career [...] But I also think that in a country like Mexico, a research institute like ours has an obligation to participate in the in the creation of knowledge and the creation of industry and also the solution to the specific problems, using knowledge. Using in this particular case bio technology.'

4.2.4 Stakeholder perspective: portrait Dr. Martijn Rutten

Currently Martijn is CTO at the financial technology company Othera and an entrepreneurial coach at HightechXL. A red line in his history is innovation, both business model innovation as well as technical innovation. While working as a senior research scientist at Philips and later at NXP, he obtained a PHD in computer science. In recent years he ran a couple of software startups which taught him the skills of entrepreneurship in the technology industry. In his own words, he grew up and old as an innovator *'Zelfs vanuit thuis is mijn pa natuurlijk een serieuze wetenschapper. Dus ik ben ook in een wetenschappers wereld opgegroeid... is toch ook allemaal innovatie'* (ENG: *'Even from home it's obvious, my dad is a serious scientist. I grew up in a world of scientists... it's all innovation anyways'*)

This is illustrated by how excited Martijn is about the technology of Applied Biotec. In his first conversation with the team, he noted the fact that it is an academic team, with an ambition to cover even more research & development for more markets and molecules. Next to that by his motivation to be part of HightechXL, which he sees as a potential innovation consultancy disruptor.

Martijn briefly sums up four elements of what captivates a startup that he likes to work with. First, it should be a technology-based startup, *'because he is a techie'*. Preferably backed up by serious intellectual property (IP), because that also helps in the business case. Second, the business proposition has to have the potential to *'conquer the world'* and make serious impact. Third, the team should be passionate and have a *'getting things done'* mentality. Fourth and final, a world improvement aspect *'is a plus'*.

Martijn uses the case of Applied Biotec to explain to people what he does for a job and what kind of startups he works with, because it is a fun example and it makes him feel proud: it is an interesting innovation that speaks to the imagination, it has a giant market and it has an ecological aspect. On the contrary, examples he would not use were 3D printing (*'boring'*) and an automatic password solution (*'does not appeal to your grandmother'*).

A very strong line in the case of Applied Biotec indeed is Martijns appreciation for the characters of Omar and Alejandro. In many different wordings, Martijn expresses the team's energy and mind-set in a positive sense: it is the first thing he remembers about the team. *'Dat die jongens enorm wel gedreven en geïnteresseerd en coachable overkomen, superaardige jongens heb ik al een aantal keer gezegd'* (ENG: *'That these boys are enormously driven and interested and come accross coachable, very kind guys is what I said a couple of times before'*)

One of the things he noted about Applied Biotec is that its solution is eco-friendly and replaces toxic pesticides. Martijn feels like he wants to be more involved

in sustainable solutions with the work he does. As an example, he uses his work at Othera, a company that ensures transparency in the financial world, trying to decriminalize the industry and prevent financial crises. Making a positive impact, yet this does not speak to him as *'improving the world'*. He makes a division between ecological sustainability and social sustainability *'Aan de ene kant er zit dus wel een aspect van de wereld verbeteren, dus die jongens eindelijk een keer eerlijk maken, maar dat is voor mij nog niet heel zwaar. En ik zou dat liever zwaarder hebben.'* (ENG: *'On one side, it does have a aspect of improving the world, by making the guys finally honest, but it is not very loaded for me. Could be more load to it.'*)

The most mentioned topic for Martijn was innovation, in combination with technology, market and impact. When asked if innovation is connected to ecological improvement, initially he did not see a connection, until he realized the link between the purpose of Applied Biotec and their technological innovation.

'Dat is heel erg innovatie, absoluut, eigenlijk alles wat bij HightechXL voorbijkomt is innovatie. En natuurlijk ja, waarom is dat belangrijk voor de wereld? Op allerlei fronten wel, het verbetert allerlei mensen levens en het kan ook ecologische achtige dingen verbeteren [...] maar bottom line vind ik het gewoon leuk.' (ENG: *'That is very much innovation, absolutely, actually everything at HighTechXL is innovation. And of course, why is that important for the planet? On all kinds of fronts it is, it improves human lives and it can improve ecological issues [...] but bottom line, I just enjoy it.'*)

5 Sustainable Case

In this chapter starts with an in-depth description of how Sustonable came to existence, including a detailed description of their solution. After the case description, three written portraits of Eric Schoneveld, Laurens van Graafeiland and Eric Broekhuizen are composed to understand the personal motivations that played a role in the becoming of the startup Applied Biotec.

‘This is the new generation composite stone [...] which is cost wise interesting, sustainably interesting and has very good product features.’ -

Van Graafeiland, personal communication, July 11, 2018

‘If we can take over half the market [...] only a third of today’s raw materials will be used, only half of the polyester resin that comes straight from oil refineries will be used, and, I don’t know how many tons of PET bottles will be recycled into our material whilst not ending up in the oceans... That is, of course, the true idea behind all.’ - Schoneveld,
personal communication, May 16, 2018

5.1 CASE DESCRIPTION

By combining ‘stone’ and ‘sustainable’ in one word, the company name reveals their main occupation: manufacturing sustainable composite stone. In 2015, Erik Schoneveld, Aad van Helden and Laurens van Graafeiland established mother company Innstech BV (another contraction: Innovative Stone Technology) to be able to work towards the launch of the brand Sustonable, which they did in 2016 (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018). Together they decided they wanted to *‘kill two birds with one stone’*, by solving the wasteful process of original composite stone production and including the waste stream of PET bottles in this process (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018) (Schoneveld, personal communication, May 16, 2018).

This case description contains an elaboration on the product and why it is relevant, the roadmap of the company from technology research to market launch and some practical information on the company structure.

5.1.1 Sustainable engineered stone

Original composite stone is a mixture of quartz (grains, sand) and a polyester resin (Van Graafeiland, personal communication, July 11, 2018). The material is most commonly used for kitchen countertops and similar application areas. As an alternative for the polyester resin, the Sustonable material uses recycled PET to bind the particles (Van Graafeiland, personal communication, July 11, 2018) (Schoneveld, personal communication, May 16, 2018). The advantages of the new technology are fourfold: in production, in distribution, in environmental pressure and in product quality (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018).

The technology makes that the manufacturing of the material can be a continuous process, instead of having to produce one sheet at a time (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018). This reduces the costs of the production and speeds up the production time (Schoneveld, personal communication, May 16, 2018). The material is thinner and stronger than its competitors (Van Graafeiland, personal communication, July 11, 2018). Because of this, they are able to transport in a way that it both lowers the risk of transport fractures and lowers the costs of transport (Van Graafeiland, personal communication, July 11, 2018).

Original composite stone uses a raw material, straight from oil refineries. On top of that, the process is not very efficient: it produces a kilogram of waste for every kilogram of final product (Schoneveld, personal communication, May 16, 2018). The fact that Sustonable is able to use a recycled material – chopped up PET bottles – makes that they can reduce the use of raw material and at the same time upcycle plastic waste (Schoneveld, personal communication, May 16, 2018). Next to that, they are able to recycle their own product (by chopping up the final product into chips again), which makes that when processing the material into kitchen countertops, cut offs can be directly recycled into their own process, as well as the whole product, after commercial use (Van Graafeiland, personal communication, July 11, 2018).

Finally, Sustonable managed to make their product scratch – and other possible user marks – resistant, which increases the durability of the product (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018). This is crucial for their market success, because Schoneveld learned that consumers do not only buy 'green, sustainable products' solely because of that reason, but they want to have good quality and appearance and it has to be affordable too (Schoneveld, personal communication, May 16, 2018).

The market of composite stone exists for 35 years, and globally 10% kitchen countertop is made from that material (Van Graafeiland, personal communication, July 11, 2018). The intention is to replace this material and on top of that, due to the materials specifications, also replace other artificial stones (ceramics and solid surface) and part of the laminate market as material for countertops (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018). Together this makes the addressable market 30% of the total kitchen countertop market, which equals 160 million m², globally worth 10 billion dollar (in business to business transactions) (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018), from which Sustonable envisions to reach a market share of 10%. In the future, Van Graafeiland and Schoneveld also see potential markets in wall cladding and tiles.

5.1.2 The roadmap to Sustonable

In 2002, in the department for sustainable development in chemistry of Royal Shell B.V., Van Helden and Schoneveld started researching the possibilities of using recycled PET instead of polyester resin (Schoneveld, personal communication, May 16, 2018). As an oil refinery, Shell is a supplier for the raw material of PET bottles, therefor they started a research group that worked on applications for recycled PET (Schoneveld, personal communication, May 16, 2018). The team managed to replace the polyester resin in the original process for recycled PET and patented the

technology on behalf of Shell (Nederland Patentnr. WO/2002/090288, 2002) and already started talking to potential customers.

After three years of working together on this project, the *'organizational code of switching jobs after approximately three years'* made Schoneveld move on to a different department and he started working at a refinery in the south of France (Schoneveld, personal communication, May 16, 2018). Van Helden, however, was part of the next phase of the PET stone project in 2009: the spin-off Echotect, backed up by Shell investment company (Schoneveld, personal communication, May 16, 2018) (Van Graafeiland & Schoneveld, Investor Deck Sustenable (non confidential), 2018). Van Helden realized he only wanted to work on sustainable development and decided to go on early retirement and start as technology consultant for the spin-off company (Schoneveld, personal communication, May 16, 2018). The company took over the original patent from Shell as well (Van Graafeiland, personal communication, July 11, 2018).

In parallel, Schoneveld did not feel comfortable working in the oil industry anymore, so he switched jobs and started working as a research and development manager for Compac, a composite stone manufacturer in Spain. In this role he ended up working together with his previous boss Van Helden again, as a possible buyer of the PET stone material of Echotect (Schoneveld, personal communication, May 16, 2018). However, technical complications in the production process made Compac back off from investment, and in 2012 another investor of Echotect pulled out for the same reasons, which meant the end of the company's existence (Schoneveld, personal communication, May 16, 2018).

At Compac, Schoneveld saw this happening and realized he was able to find ways to solve the technical issues that Echotect could not (Schoneveld, personal communication, May 16, 2018) (Van Graafeiland, personal communication, July 11, 2018). Schoneveld did not have the freedom to explore this at his job at Compac, he felt like he lost control of being able to work on what was important for him overall, so he eventually decided to quit his job and start working as a technical consultant for clients of Compac for half of his time and use the other half to work on the new project (Schoneveld, personal communication, May 16, 2018). He decided to ask his old boss Van Helden to join him in setting up their own company (Schoneveld, personal communication, May 16, 2018). Schoneveld finally wanted to complement the team with a more business focused partner and that is why he asked his old study friend Van Graafeiland to join the team (Van Graafeiland, personal communication, July 11, 2018). Both Van Graafeiland and Van Helden were working as an independent consultant at that time, and got convinced to free up time to start working together.

As a result, in 2014 the three of them founded Innstech BV and started working on the new technologies and exploring the market (Van Graafeiland & Schoneveld, Investor Deck Sustenable (non confidential), 2018). A real momentum was when they obtained a credit loan from the Dutch Government in 2015, making them able to do pilots in a factory and trial the new process (Van Graafeiland & Schoneveld, Investor Deck Sustenable (non confidential), 2018)(Van Graafeiland, personal communication, July 11, 2018). They were able to file two patent applications on the technology that solved the complications in manufacturing and on the durability and scratch resistance of the material (Nederland Patentnr. WO/2017/007322, 2017)(Van Graafeiland, personal communication, July 11, 2018).

In 2012, when Echotect went bankrupt, the original patent was bought by a Swiss company and even though the new patents are valuable stand-alone, Innstech also started to explore possibilities to buy back the patent to make their technological base even stronger (Van Graafeiland, personal communication, July 11, 2018).

In October 2016 the company launched the brand name Sustonable and this is when serious discussions with investors started (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018). When discussing with the BOM (Dutch: Brabantse Ontwikkelingsmaatschappij, Eng: Brabant Development Agency), BOM saw some steps to take businesswise for Sustonable before they wanted to invest, and as a shareholder of HightechXL they saw the perfect opportunity for them to join the HightechXL startup accelerator program (see paragraph 3.2.1) (Broekhuizen, personal communication, July 12, 2018). Without doubt, the company got selected for the program and used it to scope their market and build their brand (Broekhuizen, personal communication, July 12, 2018). At the same time they were discussing with Suez (international waste processing company) and Dekker (Dutch kitchen countertop manufacturer) for investments as well, and in March 2017 Sustonable secured the seed funding of the three parties (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018)(Schoneveld, personal communication, May 16, 2018).

In July 2018 Sustonable secured a 5 million euros funding to build a medium scale factory in Spain, to start manufacturing the material on a commercial scale (Van Graafeiland, personal communication, July 11, 2018). Currently they are investigating if a next step in scaling up could be to license the technology to other parties (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018)(Van Graafeiland, personal communication, July 11, 2018).

5.1.3 Company structure

Sustonable has three co-founders: Eric Schoneveld, Aad van Helden and Laurens van Graafeiland. Schoneveld and Van Graafeiland are full time committed and share the role of executive director, in their own specialization (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018). Van Helden officially is retired but at Sustonable he is in for one day a week as technology manager (Schoneveld, personal communication, May 16, 2018). They have expanded the team with three staff members, supporting them with business development, marketing and technology development (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018).

When Sustonable joined the HightechXL startup accelerator program in Eindhoven, the Netherlands, they exchanged the standard 8% equity with HightechXL. By joining this program, they made the final business development steps to prove they were investment ready to BOM and also to Dekker and Suez, which made them secure a seed investment round in March 2017 and since then BOM, Suez and Dekker are shareholders of Sustonable as well (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018)(Van Graafeiland, personal communication, July 11, 2018).

The company is established in Amsterdam, The Netherlands, but is building its first factory in Spain (Schoneveld, personal communication, May 16, 2018). Part of the team is also based in Spain, the rest in the Netherlands (Van Graafeiland & Schoneveld, Investor Deck Sustonable (non confidential), 2018).

5.1 PORTRAITS OF ENVIRONMENTAL ENTREPRENEURSHIP

The following portraits are meant to give an overview of the personal motivations throughout the process of establishing Sustainable. The insights are all coming from dedicated interviews, if other it is mentioned.

5.1.1 Portrait Erik Schoneveld

As a student, Erik was a competitive rower and chairman of the rowing club, where he became close friends with Laurens. As part of his studies, he went to Spain for year to do a graduation project, all together it took him some extra time to finish his study of chemical engineering at the Technical University of Eindhoven. During this period, he realized that he might have an engineering background which he enjoys, yet he did not look forward to sitting in a lab day in day out and that he liked the economical side of projects. He went to Paris for a master at IFP in Petroleum Economics and Management, at this point he stood out in not choosing to focus on oil, but on renewable energy, by carefully selecting projects and internships in that area.

Eric still regrets that he did not manage to find a job in that same field after his master, but he joined Shell at the department for sustainable development in chemistry, where he started to work for Aad van Helden, who became a mentor and inspiration throughout the years that followed. Instead of joining an organization like Greenpeace, he at least thought that in a big international corporate you really can make global impact *'Ik dacht je kunt beter vanuit een multinational de wereld veranderen dan bij een Greenpeace te gaan zitten en tegen de grote multinationals aan te schoppen.'* (ENG: *'I thought you better change the world from within a multinational, then sitting at Greenpeace and hit against the large multinationals'*)

Changing the world is a clear motivation for Eric. He is convinced about the risks of climate change for which he sees no other option than to find solutions *'... als we doorgaan op de manier waarop we de planeet op dit moment runnen, dat het dan op een gegeven moment gewoon fout gaat, dat zie je gewoon gebeuren.'* (ENG: *'If we continue the way we run the planet at this moment, then it will go wrong at some point. You just see it happening.'*)

Consumption patterns are at the base of severe resource problems: *'We hebben natuurlijk een samenleving gecreëerd waarbij het goedkoper is om je televisie weg te gooien en een nieuwe te kopen dan hem te laten repareren [...] en dat mobiele telefoontjes weggooien en een nieuwe kopen omdat het niet meer de laatste versie is. Dat kan natuurlijk niet goed zijn.'* (ENG: *'Obviously, we created a society in which it is cheaper to throw your television away and buy a new one instead of repairing it [...] and that we throw away mobile phones and buy a new one because it is not the latest model. That cannot be good of course.'*). As is the profit based economic model *'En dan ook nog een economie die alleen maar moet groeien, en als hij niet groeit dat de hele economie in elkaar ploft, dat kan natuurlijk ook niet gezond zijn' ... 'Dus prima als je meer vuil creëert en weggooit en de zee volpompt met plastic, als je maar winst blijft maken.'* (ENG: *'On top of that an economic system that only wants to grow, and if it does not grow, that the whole economy collapses, that cannot be healthy either' ... 'So, it's okay if you create more waste and throw away in the sea, as long as you make profits.'*)

And even though he is not an *'Elon Musk die zelf de hele wereld gaat veranderen'* (ENG: *'Elon Musk who is going to change the world by himself'*), he is convinced he can contribute to the cause; and maybe even be an example for others. *'Maar we hoeven ook niet allemaal Elon Musk te zijn. Als gewoon heel veel mensen op een klein niveau de problemen aanpakken en tegen de grote multinationals aan botsen dan denk ik dat op een gegeven moment er wel dingen gaan veranderen. Als iedereen denkt van wij kunnen toch niks veranderen, want de wereld is nou eenmaal zo... dan gaat het niet veranderen nee, dan gaat het ook echt niet veranderen.'* (ENG: *'But we don't all have to be Elon Musk. If only a lot of people on a very small-scale work on issues and kick the larger multinationals, then I think things might change. If everyone thinks we cannot change a thing anyway, because the world is as it is... then it's obviously not going to change, for real.'*)

After a while at Shell he accepted an internal job offer to work at an oil refinery in France, but after three years at that job he realized he was more interested in sustainable development rather than the pure economics of an oil refinery. His ideas of Shell changed drastically over the years. He got sucked into a way of working that put profits on the first place, without concerning about the environment. While working at the refinery, he saw very different environmental standards than he would have liked to see, burning money was worse than burning polluting, toxic oil residues. It made him realize that *'Dat past bij een bedrijf dat 15 miljard winst maakt en pretendeert milieuvriendelijk te zijn' ... 'Ik merkte inderdaad dat het er meer window dressing was dan realiteit.'* (ENG: *'That fits a company that makes a profit of 15 billion and pretends to be eco-friendly' ... 'I noticed indeed that it was more window dressing than reality.'*)

Finally, despite appreciating that he was working with great managers and being autonomous, Erik saw his ideas of making change at a big company like Shell fading away. He saw an inert company, steered by politics that *'you can't intervene in anyways, not even in a company'*. When he got an opportunity to start working at Compac, he got excited to work in the field of his first project again, composite stone, one that he still felt in love with. But, again here after three years he started to get frustrated again, this time due to micromanagement which made him lose his autonomy.

'Op het einde was het steeds meer, mijn CEO dat was mijn directe baas, die van dag tot dag bepaalde wat er gedaan moest worden en dat schoot me op een gegeven moment een beetje in het verkeerde keelgat' ... 'met name omdat ja, de CEO is wel een heel verstandig man die natuurlijk heel veel van deze markt weet, maar die niet technisch onderlegd is dus die vaak over dingen heen stapt die veel moeilijker zijn dan hij dacht' (ENG: *'At the end more and more my CEO, who was my direct boss, was the one who decided what needed to be done day to day, and that offended me a bit' ... 'Especially because yes, the CEO is a very intelligent man that knows a lot about the market, but he was not very technical and would step over issues that were way more difficult than he anticipated.'*)

This, and the fact that he saw Compac prioritizing away from his beloved sustainable (PET stone) project, made him realize the only way he was going to be able to work on what he enjoys and found important, was in continuing as a startup himself. Jokingly, he thanks his old boss for driving him away of his previous job. The

fact that he was able to part-time start a business next to being a consultant, was key in feeling able to make the step to start for himself.

Adding to this, he knew that one of his partners was not relying on the income of this startup as well because he had a pension already, and the other partner started in a similar way as Eric did, making the team less vulnerable for taking more risks. As a startup he is especially happy about being able to plan his own time, making him able to make more out of his working time and more out of his free time by spreading out the hours differently. Next to that, he really gets motivated by knowing the result of his work pays out to him directly, and not in the wallet of someone else.

In recent years he has learned that he does not get motivated by others opinions, but rather by knowing he put maximum efforts in trying to reach his goals. He sees Europe, and especially Spain, as a difficult playground for taking risks and being rewarded for it, compared to the United States.

‘Met name in Silicon Valley en omstreken, daar wordt het gewoon meer gewaardeerd als je dingen probeert en ook al lukt het twee keer niet, als je maar doorzet dan word je uiteindelijk toch gewaardeerd voor het feit dat je het allemaal probeert. Terwijl in Europa is het meer, met name in Spanje, [...] word je daar meer voor aangekeken voor dat ene ding wat fout gegaan is dan die negen dingen die goed gegaan zijn.’

(ENG: ‘Especially in Silicon Valley and surrounding areas, it is just way more appreciated if you try things and even if you don’t succeed twice in a row, if you push through anyways, you will be appreciated for trying it all. Whilst in Europe, especially in Spain, people pay more attention for the one thing that went wrong than the other nine things that went well.’)

5.1.2 Portrait Laurens van Graafeiland

Laurens met Erik when he was studying Technology Management at the TUE. After his study he started working in consultancy firms. First at Deloitte, where after a couple of years he was unhappy. So, when two colleagues asked him to join them in a separate business, he did so, but later realized this was a step too quick. He joined a large consultancy firm once more, this time Delta Lloyd. Then, after a couple more years working for a corporate, in 2008 he was once more convinced it was time to start his own consultancy company for market and competitive analysis.

‘Puur gewoon dat eindeloze vergaderen, gewoon zelf niet verantwoordelijkheid nemen, geen besluitvorming, geen afspraken nakomen - dat is helemaal niet belangrijk - logge organisatie. Gewoon interne politiek, dat soort dingen trekken mij niet heel erg. Ik heb dus toch eigenlijk gewoon sterk de behoefte om zelf mijn eigen plan te trekken [...] en gewoon mijn eigen ding te doen.’ (ENG: ‘Simply the endless meetings, just not taking responsibility, no decision making, no complying with agreements – it is all not important – inert organization. Just the internal politics, those things do not attract me very much. Apparently I have a very strong tendency for making my own plans [...] and doing my own thing.’)

After a short time, his business partner left and he continued by himself. These years as a self-employed without any colleagues felt lonely, which was difficult for Laurens. When Eric approached Laurens to join Sustonable, first he was happy to work with other people again. And not just any other people; Laurens is very clear about expressing his trust in Erik. They got to know each other through and through when they were in a competitive rowing team together, with a long-lasting friendship as a result. In different moments he emphasizes his blind trust in Erik and even in Aad because of this, for example by referring to *‘samen met twee hele goede mannen’* and *‘Hij had er wel heel goed over nagedacht - hij denkt altijd goed over dingen na. Was geen ondoordachte stap’* (ENG: *‘together with two very good men’* and *‘He had been thinking about it thoroughly – he always thinks things through very well. It was not an ill-considered step’*). This trust was also based on their previous experience in the project when working for Shell and Echotect.

Laurens does not want to work on projects he does not ‘feel’. In this case, he found the aspect of involving PET interesting because of the sustainability of the final product and process, and because of the innovativeness of the technology, all together increasing the potential impact of the new material. He cheers up when talking about innovation and how the material is the new generation in its kind.

For Laurens, being sustainable is evidently connected to how he grew up, which also is the base for his focus on saving resources, extending use time and avoiding wastage. Something he clearly sees back in Sustonable.

‘Ik ben altijd opgevoed vanuit de zuinigheid zal ik maar zeggen [...] en sowieso zie ik dat in de generatie voor mij, de wat oudere generatie zoals mijn schoonouders, die doen gewoon heel lang met dingen en die maken ook zelf veel meer dingen, die repareren dingen. Dus ik ben ook zelf heel erg van de duurzaamheidsgedachte van gewoon lang doen met je spullen. En niet verspillen... dat is wel een van mijn kern eigenschappen.’ (ENG: ‘I have always been raised from the perspective of

economical thinking, as I might call it [...] and in any case I see that in the generation before me, the older generation like my parents-in-law, they just last very long with things, and they make their own things, repair things. So I am also fond of the sustainability idea of just doing a long time with your stuff. And do not waste... that is one of my core characteristics.')

In accordance to this, when talking about the uniqueness of Sustonable, he emphasizes on the durability and quality of the product in compared to other products, indicating it does not break that often while being way thinner. He is also enthusiastic about reducing the use of raw material and reducing waste by using recycled plastics as well as the fact that their final product is recyclable.

Laurens was also attracted by the tangibility of the project, especially compared to his previous work as a business analyst and consultant, which involved writing reports and planning on a non-concrete level. Instead, in this project he saw a concrete market and an existing product based on technology, which he thought was a cool challenge. He had tried to do more concrete projects for his own company before, but this was not very successful thus far. Overall, he concluded the idea was very good and promising, which appealed to him *'Wij hebben gewoon iets wat de nieuwe generatie van dat spul is. Als wij die tien procent van de markt... die moeten we gewoon kunnen realiseren dus daar gaan we gewoon voor. Dus dat is gewoon een enorme grote potentie.'* (ENG: *'We just have the new generation of that stuff. If we can have that 10%... we have to be able to realize that so we are going for that. So, that is just a very big potential.'*)

The fact that he could do it as one of his consultancy projects, made him not 100% reliable of Erik and Aad, and lowered the risks involved. From previous experiences in beginning a business, Laurens knew that he could take this risk because if this project does not work out, something else will.

The collaboration with Aad and Eric continues to motivate Laurens. Even though they get more and more involved with shareholders, he still feels like the team is in charge and they can direct the company. Reflecting on his experience working in corporates, he is trying to make the company as efficient as possible, and tries not to become too big.

5.1.3 Stakeholder perspective: portrait Erik Broekhuizen

Already in his study period Erik saw the value in combining technology, in his case chemistry, with economics. When he entered the corporate life, he started at Philips Semiconductors – which later split off as NXP semiconductors - as a management trainee, and resigned 16 years later after three years of being the director of global supply chain operations.

After this experience, he was looking for a new challenge, when Guus Frericks asked him to join him in a project in Hilversum where they would connect companies to societal challenges and institutions, with a clear vision on using their experience in helping young companies in bridging the gap between them and public parties. However, after a short while he and Guus realized this work, in Hilversum, was not their expertise, whilst in Eindhoven (base of Philips and NXP) they have their background and more things that fits their expertise happens there: technology and business. Already the mindset of helping young companies was set, so the

conclusion was they wanted to do something in supporting young technology businesses in Eindhoven, which became the core business of HightechXL. For Eric, this was close to his heart.

‘Omdat ik het heel erg leuk vind om met teams resultaten te bereiken [...] dat kan een spelletje doen zijn, dat kan sporten zijn, maar dat kan ook bedrijven opbouwen zijn’ ... ‘je probeert altijd het optimale eruit te halen, maar het ene heeft meer potentie dan het andere’ ... ‘ik help eigenlijk iedereen die met een concrete vraag komt [...] omdat het leuk is om mensen te helpen.’ (ENG: ‘Because I really enjoy achieving results with teams [...] it can be in a game, in sports, but it can also be in building companies’ ... ‘you always try to get the optimal result, but one has more potential than the other’ ... ‘I actually help everyone who has a concrete question [...] because it is fun to help people.’)

Sustorable joined the selection days for the fourth program, they were introduced by HightechXL shareholder BOM. Eric discusses three main arguments for the team to be selected. First, he remembers how they valued the expertise and experience of Laurens and Eric *‘Twee ervaren mensen voor iets waar technisch inhoudelijk toch wel een aantal uitdagingen liggen, dat is wel prettig.’* (ENG: *‘Two experienced people for something that had some technical and substantive challenges, that is convenient.’*). For example the fact that the market standard was set before Sustorable entered the market, made the quest for a strong, technological proposition very important and they saw the team was up to that challenge.

Second, the proposition to recycle materials was an attractive element. HightechXL is looking for projects that do not have a negative impact, and with a preference for projects that have a positive impact. Because in practice most of the startups that have a positive impact are in medical technology, thus have a positive impact on health, Eric remembers it was nice to see a team that had a positive environmental impact.

‘Met een kwaliteitsproduct leveren wat de concurrentie aankan, maar wat op een meer sustainable manier is gerealiseerd dan de concurrentie [...] dat wil je omdat dat duurzamer is voor de hele wereld. En er zijn ook steeds meer mensen die dus daar prijs op stellen op het moment dat ze dingen kopen. Dus het is zowel een morele als ook een zakelijke reden.’ (ENG: *‘Delivering a quality product that can handle the competition, but what is produced in a more sustainable way than the competition [...] you want that because it is more sustainable for the whole planet. And there are more and more people that appreciate that when buying things. So it’s both a moral as business reason.’*)

Third, market indications were very concrete and promising, especially in succeeding existing producing methods for kitchen countertops. The fact that there were multiple possible markets, made sense in respect to joining the accelerator *‘En dat is dan ook aansluitend een van de redenen van het programma: om in die waaier van mogelijkheden een weg te kiezen.’* (ENG: *‘And that is one of the reasons for the program: to select a way in the range of possibilities’*)

Previously, Eric had been involved in a project on tidal energy, in. He proudly explains that in this role he was also involved in the creation of the North Sea

Agenda regarding the tidal energy, which made him a national expert on that topic as well. Eric believes the main problem of economic growth is the fact that the resources we have available on this planet are finite. Yet he sees all other environmental – resource – issues have to move out of the way for renewable energy, because economic growth can exist without physical production, but not without energy *‘Dus er zijn alternatieven voor economische groei, maar die zijn altijd gekoppeld aan energie. Niet altijd aan materiaal.’* (ENG: *‘So, there are alternatives for economic growth, but they are inherently linked to energy. Not always to material.’*)

In the case of Sustonable, he sees the environmental benefits of recycling material also in respect to this theory: because if they do not reuse the materials, again the resources are finite. Eric thinks that because incumbent energy solutions are very cheap, the only solution is in supporting alternative solutions into scaling them into similar advantageous positions. In a similar way, he explains the market value of starting with sustainable production, for Sustonable and other startups.

‘Er zijn ook steeds meer mensen die dat (sustainable production) als eis stellen. Niet in alle producten kan je aan die eis voldoen. Maar op het moment dat er eenmaal concurrenten zijn die dat hebben, dan kan het al heel snel de default worden vandaag de dag.’ (ENG: *‘There are also more and more people that put that (sustainable production) as a requirement. Not in all products you can meet that requirement. But the moment there are competitors that do have that aspect, it can very quickly become the default nowadays.’*)

6 Analysis

In this chapter the data analysis is presented through the lens of the theory. In paragraph 6.1 the three motivations linked to entrepreneurial motivation are analysed. In paragraph 6.2 the same has been done for environmental motivations.

6.1 ENTREPRENEURIAL MOTIVATION

In this paragraph the role of creative destruction (paragraph 6.1.1), taking risks (paragraph 6.1.2) and startup life (paragraph 6.1.3) as motivations in the two case studies are discussed.

6.1.1 Creative Destruction as a motivation

Innovation, and specifically technological innovation prevailed in all conversations: the coding of creative destruction_technological innovation was linked to 39 quotes, the highest number of all. Technological innovation is an evident part of the life of all respondents, if only demonstrated by their academic or research background (See table 9), nicely put by Rutten saying *'And of course technology, because I'm an engineer'* (Rutten, personal communication, July 10, 2018).

Table 9: Respondent history in science and innovation

Respondent	Degree	Professional research and/or innovation career
Torres Gavilan	PHD, biochemistry	Academic researcher
Piña Barazza	Msc. chemical engineering	Innovation manager
Lopez-Munguia	PHD, biochemistry	Academic researcher, professor, director research lab
Rutten	PHD, computer engineering	Corporate research & development, innovation coach
Schoneveld	Msc. chemical engineering / management and economics	Corporate research & development
Van Graafeiland	Msc. technology management	
Broekhuizen	Msc. Chemistry	Corporate management, innovation coach

An important driver for the academics is to find meaning for the research they are doing, especially in connecting science to application areas *'Are we doing science to produce articles and to respond basic questions in science, or do we use that science in order to apply it'* (Torres Gavilan, personal communication, April 25, 2018). This drive to use technology for societal application combines the dissatisfaction with previous practices as well as the drive to innovate and the level of social responsibility the respondents feel. For this a new code was created (Creative destruction_use science applied instead of research only), which enables to understand how this motivation is build up from three angles: *'The research that's being done is only for publications and for making patents without use'* (Torres Gavilan, personal communication, April 25, 2018) ... *'I left the science world because I saw that we can do some science, and some with a more direct impact in society'*

(Piña Barraza, personal communication, May 17, 2018). This seems to be a shared opinion in the academic environment *'I also think that in a country like Mexico, a research institute like ours has an obligation to participate in the creation of knowledge and the creation of industry and also the solution to the specific problems, using knowledge. Using in this particular case biotechnology'* (Lopez-Munguia, personal communication May 21, 2018), yet this does not seem to align with actual activities. As a result, they are looking to solve this with entrepreneurship (more on this in paragraph 6.3). Schoneveld, Van Graafeiland and Broekhuizen gave notice to this urge already in their time as a student, by choosing to combine science with economics and management subjects and pursuing a corporate career instead of an academic career.

Giving the new technologies a concrete goal is a theme that pops up in different categories. Van Graafeiland was attracted by the tangibility of the product, in contrast to how his career so far was concentrated around writing reports and advising (Van Graafeiland, personal communication, July 11, 2018). For HighTechXL turning technology into products is an essential part of their values *'...concrete markt, tastbaar product, technologie'* (ENG: *concrete market, tangible product, technology*), especially considering their business is in supporting young technology companies in finding and validating a market and build a business around it (Broekhuizen, personal communication, July 12, 2018) (Rutten, personal communication, July 10, 2018).

In both cases the new technology is entering an existing market, therefor aiming to supplant an existing product *'we just have the new generation for that stuff'* (Van Graafeiland, personal communication, July 11, 2018). For Applied Biotech, this is even a part of their broader vision *'we have only one solution right now, but our main goal is to make via technology reachable (to reduce impact) for other industries that contaminate a lot.'* A clear connection can be drafted between this ambition and the aversion to unethically behaving companies, as well as polluting technology (further elaboration in paragraph 6.2.1 and 6.2.2). When entering an existing market with the alternative solution, this can be more challenging but it could also result in setting the new standard and therefor increase the impact exponentially by urging competitors to follow their example (Broekhuizen, personal communication, July 12, 2018).

'Potential impact' is another pattern in the data that seems to link innovation to business opportunity: the basic idea is that a strong technology - preferably backed up by intellectual property - in combination with a good market and business model, could result in a larger impact (Rutten, personal communication, July 10, 2018). In different wordings the aspiration of potential impact of the businesses is described, examples are *'They know that what they have in their hands is something that can grow'* (Lopez-Munguia, personal communication May 21, 2018) and *'Ho shit, dat is een gigantische markt' ... 'een interessante business propositie, die echt groot is, dus potentie om echt de wereld te veroveren, dat spreekt mij het meeste aan. Dus niet iets wat ergens in een hoekje 10 miljoen kan verdienen'* (ENG: *'Ho shit, that is a gigantic market' ... 'an interesting business proposition, that is really big, so it has the potential to conquer the world, that appeals to me the most. So not something that can earn 10 million in a corner'*) (Rutten, personal communication, July 10, 2018) and *'ik wil wel iets doen dat ik denk: hey daar zit gewoon heel veel potentie in. Echt heel veel potentie' ... 'the sky is the limit'* (ENG: *'I want to do something that I think: hey, this just has a lot of potential'*) (Van Graafeiland, personal communication, July 11, 2018).

Some respondents specifically mention that doing what they do right now is also due to their interest and joy in working with innovation *'maar bottom line, vind ik het (innovation) gewoon leuk'* (ENG: *'But bottom line, I just really enjoy it'*) (Rutten, personal communication, July 10, 2018) and *'ik denk in die zin dat het iets nieuws is vind ik wel iets innovatiefs, daar ben ik altijd wel voor... dat vind ik wel leuk'* (ENG: *I think it that sense, that it's something new I believe is innovative, I'm always for that, I like that'*) (Van Graafeiland, personal communication, July 11, 2018).

6.1.2 Taking risks as a motivation

Sometimes that what is not said is even more interesting than what is said: the uncertainty of starting a business was not often part of the entrepreneur's stories. When specifically asked about how they felt by making a step that might be considered risky, most of the answers were about how they mitigated the risks. Three out of the four entrepreneurs started this journey with a reduced risk strategy: they slowly built up the hours spend on the project, whilst working as a freelance consultant on the side (Piña Barraza, personal communication, May 17, 2018) (Schoneveld, personal communication, May 16, 2018) (Van Graafeiland, personal communication, July 11, 2018). This made them approach the start of the business as a project rather than a full commitment, which seems to reduce the risk perception in all these cases. In contrast, Torres Gavilan was fully committed from the first moment he launched the business, but he had been backed up by the university with free laboratory use and mentoring.

Over time however, Torres Gavilan sees two reasons why he is more uncertain now he has been an entrepreneur for a while, compared to when he started *'when you grow older, you're more frightened... concerned about the risk. So, I'm not 25 years old (anymore) and the risk when I took the decision to become an entrepreneur, felt much lower, than the risk than I now feel of being an entrepreneur... because you grow older'* and *'it might be that when you start, if it fails soon than I can do anything else, right? I can come back to the university or I can search for another job... As the time passes, you're attached to your startup and you start to love it like a baby, so you don't want to lose your startup'*.

During the analysis a big pattern was recognized in collaboration and trust, for which a new code was created *'taking risks_trust in team'*, with 23 linked quotations. In most examples it took the form of a risk mitigation *'I know Alejandro and I trust him and I know that he's a very honorable and honest and that he has a very good academic background'* (Lopez-Munguia, personal communication May 21, 2018), *'Het zijn aardige gasten, duidelijk coachable, duidelijk eager... waarvan ik denk: ja deze jongens zijn gedreven, die kunnen wat, die hebben een get things done attitude'* (ENG: *'They're nice guys, clearly coachable, clearly eager... that makes me think: yes these boys are driven, they can do things, they have a get things done attitude'*) (Rutten, personal communication, July 10, 2018) and *'het was gewoon een heel goed idee. Hij had er er wel heel goed over nagedacht - hij denkt altijd goed over dingen na. Was geen ondoordachte stap'* (ENG: *'It was just a very good idea. He had been thinking about it thoroughly - he always thinks things through very well. It was not an ill-considered step'*) (Van Graafeiland, personal communication, July 11, 2018). Especially interesting is the repeat rate of this code by the entrepreneurs and mentors that made that point.

This compared to on the other side, where the two entrepreneurs that appeared to have initiated the collaboration, Schoneveld and Torres-Gavilan do not mention trust or collaboration, yet they do have in common that they were first connected with their future co-founders through friendship, which could be considered a way of expressing trust. Piña Barazza also expresses the beginning of the relationship with Torres Gavilan as a friendship (Piña Barazza, personal communication, May 17, 2018). What stands out is how the respondents all have an air of complete logical thinking when talking about this topic, also indicated by using words like *'rather logical choice'* (Schoneveld, personal communication, May 16, 2018) and the quick step from friendship to beginning a company *'But Alejandro became my friend and after we tried to quit the company (incubator) we decide to start the company'* (Piña Barazza, personal communication, May 17, 2018).

Again, uncertainty as a motivation to begin a business seems to be difficult to distil from the data. The quotations that fit this theme are almost all connected to situations after the beginning of the business and how uncertainty at least was not a threshold to begin a business *'Dus ik had wel ervaring dat het eigenlijk altijd weer weer goed komt'* (ENG: *'So I had the experience that it actually always would get right again'*) (Van Graafeiland, personal communication, July 11, 2018). What does come forward at some moments is how choosing for an independent career could result in a bigger reward for the entrepreneurs, also known as the concept of entrepreneurial reward *'Het gevoel dat je het voor jezelf doet, voor je eigen bedrijf en niet voor de portemonnee van iemand anders'* (ENG: *'The feeling that you're doing it for yourself, for your own company, and not for the wallet of someone else'*) (Schoneveld, personal communication, May 16, 2018) and Piña Barazza even marks it as one of the most important motivations for him to begin a business *'I say if I can do that for other persons, I can do that for my own projects. That was the only thing, I just wanted to create my own things.'*

The perspective of being able to take more risk and learn from mistakes was clearly indicated by Torres Gavilan *'So this startup also allows to experiment, if we're doing stuff right or wrong'* in connection to a dissatisfaction with a corporate working style (paragraph 6.1.3) which would limit him to working out of the books (Torres Gavilan, personal communication, April 25, 2018).

6.1.3 Startup life as a motivation

The characteristics of a startup seem to be appealing for many reasons. Some explicitly call entrepreneurship a solution for what they consider the traditional industry (Lopez-Munguia, personal communication May 21, 2018) (Piña Barazza, personal communication, May 17, 2018) (Schoneveld, personal communication, May 16, 2018) An example of Schoneveld: *'Toen dacht ik eigenlijk intuïtief op een gegeven moment van je kunt beter vanuit een start up doen want ja dan kun je echt iets veranderen'* (ENG: *'That's when I intuitively thought you better do that in a startup because than you can really change something'*). As discussed in paragraph 6.1.1, for the academics Torres-Gavilan and Piña Barazza the fact that they were not able to make the social impact while working on basic science, made them appreciate the advantages of a startup.

These statements are supported when turning this thought around: all entrepreneurs use their previous experiences to explain why beginning an

independent company was an obvious choice. This resulted in a range of subfamilies for the code 'dissatisfaction with previous practices'.

Heading that list is the discomfort and, in some situations, even frustration with a corporate working style (dissatisfaction practices_corporate working style). The respondents are referring to internal politics and organizational inertia *'the bureaucratic requirements of a university'* (Lopez-Munguia, personal communication May 21, 2018), *'Dat een multinational zo log en zo moeilijk is en zo bepaald wordt door politiek dat je daar toch überhaupt niks aan kunt doen, ook niet binnen een bedrijf'* (ENG: *'That a multinational is so inert and difficult and so defined by politics and that you can't do anything anyways, also not in a company'*) (Schoneveld, personal communication, May 16, 2018), *'Dat eindeloze vergaderen, gewoon zelf niet verantwoordelijkheid nemen, geen besluitvorming, geen afspraken nakomen – dat is helemaal niet belangrijk – logge organisatie... ja, gewoon interne politiek, dat soort dingen trekken mij niet heel erg'* (ENG: *'Simply the endless meetings, just not taking responsibility, no decision making, no complying with agreements – it is all not important – inert organization. Just the internal politics, those things do not attract me very much.'*)(Van Graafeiland, personal communication, July 11, 2018). Also, management styles are criticized, Schoneveld even jokingly thanked his previous manager for scaring him out of his job because of micromanaging him.

On the other side, the prospective of working in a corporate environment was also used in explaining why they at least made the choice not to seek a career in a corporate environment *'I want to be able to take my own decisions of which kind of job do I want to have, right... and not to be imposed by a corporate idea of okay you have to deliver quality control daily and this has to be 80% no byproducts and blablabla and to be attached to it. I rather be in a more creative area of okay how do we deal with this problem and that kind of things'* (Torres Gavilan, personal communication, April 25, 2018).

Schoneveld and Piña Barazza talk about a growing disagreement with their former employers' visions (coded with dissatisfaction with previous practices_not aligned with company), especially regarding moral concerns. Piña Barazza realized in his business he was helping the wrong companies taking advantage of subsidies, and Schoneveld was not charmed by how Shell put economic progress over the planets well-being. At Compac he saw a lost in interest in the project that was so loved by him. This motivation links ethical concern to the practical situation of not wanting to be involved in certain practices (more in paragraph 6.2.1).

An individual reason to be dissatisfied with previous practices was the lack of possibilities to make a next career step for Torres Gavilan (dissatisfaction previous practices_no personal development). For Van Graafeiland the fact that he finally was working together with more people than just himself was a motivation on itself (dissatisfaction previous practices_working alone), which is corresponding with the emphasis he puts on trust and collaboration (see paragraph 6.1.2).

Previous experiences were not only a reason for dissatisfaction. A new code was created for how the entrepreneurs were inspired by their previous experience to make the decision to begin a business (code: inspired by previous experience). First of course, both technologies were part of a project of the previous workplace of Torres Gavilan and Schoneveld. For Piña Barazza and Van Graafeiland their experiences helped in understanding what it means to be an entrepreneur *'I learned a lot... of things that I didn't know nothing about [...] all the information I learned –*

about business, about market, about customer management or project management – I didn't know anything about that. The only thing that I knew how to do was science' (Piña Barraza, personal communication, May 17, 2018) and Van Graafeiland had been an entrepreneur for many years before. In contrast, Torres Gavilan recalls the experience of becoming an entrepreneur '*a leap jump*', referring to how unprepared he was in terms of entrepreneurial knowledge.

Finally, independency is a theme that all respondents seem to connect to their decision to become an entrepreneur. The dissatisfaction with the previous work experience is clearly linked to this motivation, often the one argument followed the other, as illustrated by the follow quote of Van Graafeiland '*Ik denk dat ik er wel achter ben gekomen dat ik niet helemaal in zo'n grote corporate omgeving in ieder geval functioneer [...] ik heb dus toch eigenlijk gewoon sterk de behoefte om zelf mijn eigen plan te trekken*' (ENG: '*I think I did find out that I do not function in such a large corporate environment [...] Apparently I have a very strong tendency for making my own plans*') (Van Graafeiland, personal communication, July 11, 2018). Piña Barazza mentions the word 'freedom' three times and Van Graafeiland sees the urge for indepenency in connection to the stubbornness he recognizes in him and Schoneveld. Finally, all four entrepreneurs talk about their search for a more autonomous work situation: '*It allows to take decisions based on discussing [...] not to go by the book and say okay to solve this problem you have to do A, B, C, D*' (Torres Gavilan, personal communication, April 25, 2018).

6.2 ENVIRONMENTAL MOTIVATION

In this paragraph the role of ethical concern (paragraph 6.2.1), ecological concern (paragraph 6.2.2) and stakeholder action (paragraph 6.2.3) as motivations in the two case studies are discussed.

6.2.1 Ethical concern as a motivation

Another topic that stands out in numbers is the sense of social responsibility of the respondents (30 quotations). Six out of seven respondents specifically expressed this, in different ways. Social responsibility is linked to ecological concern (paragraph 6.2.2) because of the context of the issues the respondents feel worried about. It is linked to the purpose of innovation (paragraph 6.1.1) by the social impact they want to make with the (technical) capabilities they have, again citing Piña Barazza '*We can do some science and some... with a more direct impact in society.*' How the respondents gave meaning to this topic ranges from a regional perspective to a global perspective. In contrast to the topics that can be connected to this motivation such as ecological concern and innovation, this code specifically includes a clear urge for personal involvement.

For example, Piña Barazza wants to leverage his influence as an entrepreneur to create jobs and be involved in political decisions '*It's important to canalize our knowledge and our ambitions to make a better, not only environment, make a better ecosystem to live there*' (Piña Barraza, personal communication, May 17, 2018). The perspective of Torres Gavilan completely changed when he got children, which changed his attitude towards the future – not only for his children, but for everyone '*You have to response for a creature or a person that you're responsible*

for [...] if we continue damaging the world, then they won't have a place to live' (Torres Gavilan, personal communication, April 25, 2018).

Finding solutions for social problems is a description corresponding with social responsibility that is shared by Lopez-Munguia, Torres-Gavilan and Piña Barazza. Schoneveld, Rutten and Broekhuizen refer to 'a positive impact on the whole planet' in different wordings. For Schoneveld this has been a motivation from his study onwards, yet not always as successfully executed *'Ik merkte eigenlijk dat Shell, die communiceerde natuurlijk over sustainable development in die tijd, maar ik merkte inderdaad dat het er meer window dressing was dan realiteit [...] dat was eigenlijk de hoofdrede om bij een multinational te gaan werken: ik dacht van je kunt beter vanuit een multinational de wereld veranderen dan bij een Greenpeace te gaan zitten en tegen de grote multinationals aan te schoppen'* (ENG: *'I realized that Shell, that communicated about sustainable development in that time, but I realized that it was more window dressing than reality [...] that was actually the main reason to work for a multinational: I thought you better change the world from within a multinational, than sitting at Greenpeace and hit against the large multinationals'*) (Schoneveld, personal communication, May 16, 2018). When explaining the start of HightechXL, Broekhuizen emphasises the fact that their first personal ambition was to use their experience and knowledge to help and support the development of young startups.

Schoneveld is very convincing in communicating his sense of social responsibility, by using this opportunity to enlighten a fitting Spanish saying and by explaining how he lost respect for some friends that did not share his vision: *'Ik ben geen Elon Musk² die zelf de hele wereld gaat veranderen [...] maar ik hoop wel dat ik in ieder geval mijn graantje kan bijdragen, zeg maar, mijn steentje kan bijdragen. En ik zei graantje want in het Spaans heet het een graantje rijst in plaats van een steentje bijdragen' ... 'Het enige is dat ik sommige mensen minder ben gaan waarderen omdat ze daar (sustainable development) niks om geven'* (ENG: *'I'm not Elon Musk who is going to change the world by himself [...] but I do hope that I can contribute my part' ... 'The only thing is that I have come to appreciate some people less because they do not care about it (sustainable development)'*)

Furthermore, four different codes were made to capture issues with the legitimacy of traditional technologies, existing companies, the government and the economic system. The respondents challenge traditional technologies as a result of their ecological impact, Torres Gavilan used the words 'contaminate' and 'damage' in that context (Torres Gavilan, personal communication, April 25, 2018). Already during his study time Schoneveld was challenging the traditional oil industry by choosing to find projects in renewable energy (Schoneveld, personal communication, May 16, 2018).

In line with that, a deeply rooted frustration is the unethical choices that traditional – or incumbent – companies make. Especially this lack of responsibility is a painful topic. When asking Torres Gavilan whether polluting pesticides is a big problem in Mexico, his answer demonstrates the skeptical feelings *'Well, not for the companies that are selling the pesticides'* on which he later elaborates *'Those big corporates claim that they have a mission for 2050, that they have to take action, replacing pesticides, and that they are doing everything they can do. However, they*

² Founder and CEO of, amongst other, Tesla Motors and SpaceX and known for his vision on sustainability and the perpetuation of humanity.

are not uncomfortable on selling millions of tons of the chemical toxics pesticides, right. So, you have to be very careful of what the actions of these companies are' (Torres Gavilan, personal communication, April 25, 2018). Piña Barazza also sees a lot of inequality and dishonesty favouring larger companies (Piña Barazza, personal communication, May 17, 2018). Rutten uses an example of another company he is involved in, which fits with Piña Barazza's view on dishonest companies, he says *'Dat wij de volgende kredietcrisis voorkomen door de jongens eerlijker te maken'* (Rutten, personal communication, July 10, 2018).

This topic aligns with the startup life as a motivation (paragraph 6.1.3), because the respondents clearly challenge the legitimacy of the choices that the companies the respondents used to be involved with make. Especially for Schoneveld this was deeply rooted because of the fact that he worked for one company that was clearly polluting and did not have a priority to do something about it and for another company that also did not pull through on a more responsible product. Making financial profits seemed to be their only concern, at the cost of anything, something that Schoneveld did not want to be part of (Schoneveld, personal communication, May 16, 2018).

This is a good example of how Schoneveld and Broekhuizen blame the current economic system that is centralizing financial profit for many, if not all, issues that have to do with sustainable development (Broekhuizen, personal communication, July 12, 2018)(Schoneveld, personal communication, May 16, 2018). An 'unhealthy situation' according to Schoneveld (Schoneveld, personal communication, May 16, 2018). About this Broekhuizen said *'De economie en aantal dingen die gewoon heel dwingend zijn, die we elkaar op de een of andere manier opleggen, van er moet groei zijn'* (ENG: *'The economy and a couple of other things that are just very compelling, which we impose on each other, in one way or the other, that growth has to be there'*) and he specifically sees this in the perspective of energy, money being just another way of expressing energy (Broekhuizen, personal communication, July 12, 2018).

Finally, Piña Barazza seriously challenges the legitimacy of the Mexican government and lack of regulation because of corruption. He feels no doubt in allocating all the problems in Mexico to corruption *'It's a very easy question because the problem in Mexico is the corruption. Indefinitely. And what we know about the politics is that they are very very rich, very very rich, and they make business with all the big companies, providing some beneficial conditions to do things that are not very regulated and that can drive to the kind of situation that I'm talking about, like the condition of rivers, the pollution of rivers. Because if you study that case, you can see that all that happened because of corruption'* (Piña Barazza, personal communication, May 17, 2018). Corruption and seeing the results of an irresponsible government makes him 'feel hungry' for change (Piña Barazza, personal communication, May 17, 2018).

6.2.2 Ecological concern as a motivation

The ecological state of the planet is a clear concern for all respondents. Not all give a similar value or explanation to it however. This category is characterized by the historical references, even going back to growing up, shaping the respondents view on sustainability and ecological risks for the continuity of our planet.

First of all, the respondents all have the tendency to explain their concern for this planet as something that is obvious and 'just there', as marked by the code ecological concern_environmental concern internalized. Piña Barazza and Torres Gavilan link this to the increase of awareness (code: ecological concern_awareness) that they get through learning more and more about the topics, for example after the introduction of the internet *'I started to learn a lot of things that I didn't know before... political things, social things and environmental things... the internet makes a change for me, the information was now in front of me'* (Piña Barazza, personal communication, May 17, 2018) or when learning more about the pesticides market during his PHD *'And the more and more I learn, the more and more that goes into my bone'* (Torres Gavilan, personal communication, April 25, 2018).

Lopez Munguia his own analysis of why he did not talk about ecological issues specifically was that for him biochemical research always has a component of ecological improvement in it. The numerous examples he gives of his projects underpin this statement, as he also concludes *'many projects had that component, to produce something instead of extracting instead ore modifying the environment'* (Lopez-Munguia, personal communication May 21, 2018). Van Graafeiland explains that he grew up in the spirit of efficiency, money wise but also in terms of durability, and calls this one of his key characteristics (Van Graafeiland, personal communication, July 11, 2018).

Climate change adaptation (code ecological concern_adaptation) is not a very common topic. It is relatable to the worries about the future state of the planet, but only Torres Gavilan *'And if we continue damaging the world, then they (his children) won't have a place to live'* (Torres Gavilan, personal communication, April 25, 2018) and Schoneveld *'Je kunt altijd discussiëren over of klimaatverandering bestaat of niet, ik ben er van overtuigd van wel. Dus er moet gewoon een oplossing voor komen'* (ENG: *'You can keep discussing the realness of climate change, I am convinced it is real. So we just need a solution.'*) (Schoneveld, personal communication, May 16, 2018) specifically bring climate change issues it to the attention.

Both startups have a solution that is a good alternative to an incumbent technology because it reduces the amount of raw material that is feeded into the production (Applied Biotec, 2018) (Van Graafeiland & Schoneveld, 2018). This is clearly reflected by the amount of quotations that fit the categories of ecological concern_resource efficiency, both in the way the companies communicate their story as in the personal motives. Broekhuizen links the urgency of recycling to the fact that resources are limited (Broekhuizen, personal communication, July 12, 2018), supported by Schoneveld who has personally seen at Shell how fast we are in reaching those limits *'Ik bedoel in een tijdperk van 200 jaar verbranden we de olie die in miljoenen en miljoenen jaren opgeslagen is'* (ENG: *'I mean, in an age of 200 years we burnt oil that has been conserved for millions and millions years.'*) (Schoneveld, personal communication, May 16, 2018).

Originally, the solution of Sustonable was part of a project that was looking for applications for recycled PET bottles, made of plastic that was side product of oil refinery (Schoneveld, personal communication, May 16, 2018). The motivation in that time really was to turn this waste into a valuable resource and avoid plastic pollution in oceans (Schoneveld, personal communication, May 16, 2018). On top of that the recycled PET replaced a material that was very wasteful in the production process

‘Voor elke kilo product die in het keukenblad komt, wordt ongeveer een kilo weggegooid aan stoffen. Dus dat is niet echt een zuiver productieproces’ (ENG: ‘For every kilo product that ends up in a kitchen top, about another kilo is wasted in material. So that is not really a clean production process’) (Schoneveld, personal communication, May 16, 2018). Van Graafeiland sees their impact on resource efficiency as a key element to be involved *‘Niet verspillen... dat zit ook in onze case gewoon heel sterk. Dat is wel een van mijn kern eigenschappen’* (ENG: *‘And do not waste... that is also a very strong part of our case. That is one of my key characteristics’*) (Van Graafeiland, personal communication, July 11, 2018).

Applied Biotec completely eliminates any of the original resources, like land and water, that were used to produce their product and clearly communicate about this (Applied Biotec, 2018). However, in the interviews Torres Gavilan and Piña Barazza do not discuss this characteristic of their technology at all and the same goes for Lopez-Munguia and Rutten. An exception is, as mentioned before, how Lopez Munguia explains that bio chemical solutions tend to have the component of producing the molecules instead of extracting or modifying the environment, vaguely linking to the use of resources.

The startups also have in common that their new technology drastically reduces pollution in production and use (Applied Biotec, 2018) (Van Graafeiland & Schoneveld, 2018), corresponding with the code ecological concern_pollution. During the analysis, it appeared that sometimes concerns about pollution could clearly be associated to how it affected the sustainability of the planet or how it affected humans, which is why two codes were added (ecological concern_pollution affects humans and ecological concern_pollution affects sustainability of planet). Generally, pollution is a heavy weighed concern, in total 34 quotations are linked to the three codes.

The chili molecule that Applied Biotec produces is an organic alternative for toxic pesticides, this feature clearly reflects in the motivations of Piña Barazza, Torres Gavilan and Lopez-Munguia. In Mexico they see the worrying results of toxic pesticides on people *‘I see people in Mexico that may fall dead because of the chemical compounds they are spreading into the cultures [...] and you can see also some [birth defects], by this I mean that people are having kids that already are ill ... when they are born. They already have a disadvantage... a lack of a hand or view or whatever. And it correlates with the main activity of that town... which is agriculture’* (Torres Gavilan, personal communication, April 25, 2018), but also the traditional extraction method of capsaicin is a worry *‘But the problem was that capsaicin was toxic for workers in this part of the factories’* (Lopez-Munguia, personal communication May 21, 2018). The latter was the original reason to start researching possible solutions in the research lab of Lopez-Munguia when Torres Gavilan joined that research team (Lopez-Munguia, personal communication May 21, 2018) (Torres Gavilan, personal communication, April 25, 2018). The combination of addressing the polluting production process and at the same time replacing an alternative in the market which pollutes when being used, makes it extra special for Rutten, who seems to be skeptical about solutions that bring only half of the story, to compare this he says *‘Als ik een elektrische auto rijdt klinkt ook prachtig, maar als die door een kolencentrale wordt opgewekt die elektriciteit schiet het ook niet op, of dan wordt nog erger...’* (ENG: *‘If I drive an electric car that sounds great as well, but if that energy is*

produced at a coal plant, that doesn't work either, or makes it even worse') (Rutten, personal communication, July 10, 2018).

For Piña Barazza it is not just their current project that brought his attention to pollution issues. He has been interested in the topic since his youth *'I was real concerned about the contamination that provoked because of the animal industry'* and the lack of responsibility from companies and regulation from the government makes pollution a big problem in Mexico (see paragraph 6.2.1) (Piña Barazza, personal communication, May 17, 2018). It all fits with how the team vision is to combine pollution issues with their ability to find sustainable alternatives *'We have only one solution right now, but our main goal is to make via technology reachable for other industries that contaminate a lot'* (Torres Gavilan, personal communication, April 25, 2018).

For Sustonable the main focus is on what Broekhuizen describes as *'Als je eenmaal materialen hebt die vervuilen, dan is het dus beter om die te hergebruiken dan om weer nieuwe te fabriceren dan wel te delven'* (ENG: *'Once you have materials that are polluting, then it is better to reuse them than to make new ones or to delve them'*) (Broekhuizen, personal communication, July 12, 2018). Using PET (plastic bottles) reduces the risk of plastic waste polluting the ocean and at the same time it eliminates the use of toxic chemicals in the production process. For Schoneveld the combination of both is key of what they do *'Onze grondstof, het bindermateriaal is 100% recycled petflessen, terwijl in de huidige industrie wordt er polyesterhars gebruikt wat direct uit de olieraffinaderij komt [...] dan worden er weet ik veel hoeveel ton petflessen gerecycled in ons materiaal terwijl ze niet in de oceanen terecht komen. Dat is het echte idee natuurlijk erachter'* (ENG: *'Our material, the binder material is 100% recycled PET bottles, whilst in the current industry polyester resin is used that comes straight from the oil refinery [...] than I don't know how many tons of PET bottles are recycled in our material, at the same time they do not end up in our oceans. That is the real idea ofcourse'*) (Schoneveld, personal communication, May 16, 2018). Schoneveld had seen the polluting oil refinery processes in his time as a manager at Shell, and this even motivated him to quit his job at that point in time (Schoneveld, personal communication, May 16, 2018).

6.2.3 Stakeholder action as a motivation

Of all topics, this category appears to be the least relevant. Only nine quotations have been connected to this family with three subcodes (stakeholder action_withdrawal of stakeholders, stakeholder action_new consumer information and stakeholder action_government involvement).

Only when specifically asking if Torres Gavilan saw an opportunity in the fact that the traditional pesticides market is put under pressure for their polluting products, he realized the organic market could be interesting (Torres Gavilan, personal communication, April 25, 2018). The market that Sustonable is targeting does not seem to be under much pressure either (Van Graafeiland, personal communication, July 11, 2018).

The consumer value in sustainable solutions is recognized by Broekhuizen and Van Graafeiland, but not valued as the most important driver *'Eigenlijk is het duurzame verhaal een beetje extra nice to have, wat wel voor de nieuwe generatie*

heel mooi is, ik denk voor een deel is het wel hetgeen wat ze overtuigt, maar voor een deel is het ook niet het belangrijkste' (ENG: 'Actually the sustainable story is a bit nice to have, what is great for the new generation, it might be partially what is going to convince them, but it is also not the most important') (Van Graafeiland, personal communication, July 11, 2018) and 'Omdat dat duurzamer is voor de hele wereld. En er zijn ook steeds meer mensen die dus daar prijs op stellen op het moment dat ze dingen kopen' (ENG: 'because it is more sustainable for the whole planet. And there are more and more people that appreciate that when buying things.') (Broekhuizen, personal communication, July 12, 2018).

An interesting twist in how government involvement might have motivated the entrepreneurs was when Piña Barazza introduced the topic of corruption and bad regulation – so when a government is involved in a negative way, instead of incentivizing the entrepreneurs (Piña Barazza, personal communication, May 17, 2018). This motivation is part of the ethical concern category (paragraph 6.2.1). For the Sustonable team it was a bit different, the moment they got a credit loan from the government was the point when the team moved from a project mode to a serious business mode (Van Graafeiland, personal communication, July 11, 2018). However, Schoneveld did not even mention this in his story.

7 Conclusion

In this chapter the researcher intends to answer the main research question by using the case study results to discuss the role of entrepreneurial motivations (paragraph 7.1) environmental motivations (paragraph 7.2) in starting an environmental business. Next, in the final conclusion the interaction between the motivations is discussed (paragraph 7.3).

7.1 ENTREPRENEURIAL MOTIVATIONS THAT INFLUENCE THE CHOICE TO START AN ENVIRONMENTAL STARTUP

The case studies examined how entrepreneurial motivations played a role in starting a business. First of all, the results show that science and technology exist as a red line in the lives of all seven respondents. The researcher analyzed that, at different moments in their life's, the respondents realized they wanted to apply their knowledge and the technologies they develop, rather than working on just basic science. When talking about the new technology, in most cases the possibilities and technological features take the first place in the order of explanation. For the stakeholders this personal motivation of applying technology is underpinned by the known purpose of the University lab and HighTechXL.

Especially the Dutch respondents showed enthusiasm for working on projects with great market potential and all respondents indicated that the anticipated size of the markets worked as a risk limitation. Risk and uncertainty remain an unclear topic. Only two respondents have marked the potential entrepreneurial reward as a personal motivation. The results revealed more about the reasons for early stage absence of uncertainty in the startups, for which friendship and blind trust were an abundant topic.

An important part of entrepreneurship is the way of working that a startup facilitates. Independency and autonomy are a motivation shared by all four entrepreneurs, and very much in line with the dissatisfaction with their previous work place regarding the way of working that is common practice in corporates and universities. Two respondents put more weight to the fact that they had to do work that they considered immoral and one respondent did not have the ability for personal growth. All together they agreed on moving away from the bureaucratic, structured and inert organizations they had been involved in personally, or they have seen around them, which restricted their personal ambitions. This is another reason why the involved stakeholders consider entrepreneurship a solution to innovate faster.

7.2 ENVIRONMENTAL MOTIVATIONS THAT INFLUENCE THE CHOICE TO START AN ENVIRONMENTAL STARTUP

All respondents show a high level of morale and responsibility, ranging from the obligation to help people, to a global perspective of being responsible for the sustainability of the planet. Even though sometimes the concept of sustainability is put on the second place, after creating new business, the results show that the respondents give a lot of attention to how they can be positively involved in society. Making social impact with their capabilities is an important motivation. Results show

that, in line with this, the legitimacy of existing companies and technologies is seriously questioned, specifically towards their involvement in the deterioration of the ecological state of the planet. Applied Biotec also links this, in combination with the government, to the concept of corruption. The research indicates that the economic state of Mexico has an extra effect on the team of Applied Biotec, making them more concerned about the health and prosperity of their local community and looking for ways how they can be involved, for example by beginning a business – not just to solve environmental issues, but also to be part of improving the economy.

The results show that all respondents understand and are concerned by the ecological pressure that is put on the planet. Both startups combine the reduction of toxic pollution and a resource efficient process. The Mexican respondents put more value on the reduction of the toxic pollution of pesticides and the Dutch respondents put more value on the way they limit the use of raw material and they include recycled materials. The analysis furthermore revealed that the respondents consider their concern about the environment as internalized and a part of their character. For one respondent, their concern about the environment was a reason to stop at the two jobs he had before starting the business.

The analysis shows that stakeholder involvement does not play a significant role in these cases with respect to the motivation to start an environmental business.

7.3 CONCLUSION

This research studied how environmental and entrepreneurial motivations interact in starting an environmental business. Results show that starting an own business enables the entrepreneurs to get out of the limitations of their previous workspace concerning the abilities to use technology for a societal application and work on projects that fit their moral standard, and they state this as highly motivating. The analysis furthermore shows that this moral standard is clearly connected to a high sense of responsibility of the entrepreneurs for the well-being of other members of society and the sustainability of this planet.

The results also indicate that the respondents put most weight on being able to work on concrete solutions with a clear market opportunity, yet in less outspoken words they all state that they would never work on a product that does not fit the characteristics of an environmental solution. For a part of the respondents, the way of working at a large corporate simply does not fit them (anymore) and therefor plays a large role in the decision to start a company for themselves.

The respondents gave first priority on working with technologies and secondly really try to use this to replace technologies that are contaminating or processes that are inefficient in the use of resources. For the team of Applied Biotec an indirect motivation is the possibility to gain leverage in broader political issues.

8 Discussion and recommendation

In this chapter the researcher evaluates the research and research limitations. The chapter ends with further research recommendation to build upon this research.

8.1 INTERPRETATION OF RESULTS

From literature (chapter 2), several motivations to start an environmental business were identified, but they have not been analyzed next to each other. This research has been able to show whether these motivations indeed play a role in that process and to what level they are leading.

Research on environmental entrepreneurship has indicated the importance of entrepreneurship in addressing ecological uncertainty and innovation challenges (York & Venkataraman, 2010), and the results of this research add to that by revealing the motivations of entrepreneurs that do this, and stakeholders that are involved in these processes. These results might help organizations, like HighTechXL and universities, in understanding how they might motivate engineers and other technical professionals to be involved in environmental entrepreneurship and what might not be relevant in convincing them.

The research clearly confirmed the importance of creative destruction as a motivation, especially how the concept of innovation collectively was constructed in a way that it combines technological innovation and a relevant, scalable market application. The fact that incumbent companies did not provide the respondents with the opportunity to innovate and work on relevant projects, clearly aligns with the theory on how important entrepreneurship is for innovation and sustainability, as proposed in the introduction of this research. The research results reveal the importance of having been part of something concerning yourself previously, in order to look for a solution in entrepreneurship. Concerns might have to do with the way of working, organization ethics or the ecological state of the planet.

This study did not show the interference of stakeholder action as a motivation for environmental entrepreneurs. That is remarkable, since the topics of toxic pesticides and plastic pollution are very alive in global discussions. It might be explained by the fact that market need surpasses, which makes interference of stakeholder action irrelevant.

An interesting trend with respect to the involvement of HighTechXL in both startups is that indeed, after being part of the startup accelerator that very much focuses on finding an impactful market, the startups seem to take over this perspective.

The multiple case study design allowed the research to view the issue from two angles. This had an influence on some of the motivations, for example the difference of growing up in a country in development (Mexico) and a developed country (Netherlands) made a difference in perspective on what is prioritized by the respondents for sustainable development. However, the aspects of the cases that were similar did have an influence too, for example the academic background and patented technologies made all respondents very keen on the technical aspects of their product. The cases matched the research objective very well.

An interesting pattern that this research method did not allow to report on, is how different the experiences of these respondents were with regards to their

conceptualization of sustainability and entrepreneurship. All had a different road to understanding why it is important to invest time and effort in sustainable development.

8.2 RESEARCH LIMITATIONS

The model with the motivations that derived from theory required an explicit statement of motivation in the interviews with the respondents, in practice, the transcription show that motivation is hidden in implicit ques. The theory that appeared to be very clear in designing the research, turned out to have some imperfections when analyzing the data.

By portraying some of the stakeholders and mentors too, it was possible to see how that influences the progress of the companies. It was difficult however to compare their specific motivations, rather they have been included in the overall set. It is important to bear in mind the possible bias of their responses, due to their professional connection to HighTechXL and the National Autonomous University of Mexico.

When analyzing the results in Atlas.ti, it is possible to change and redirect codes at any moment, which comes with the risk of overcomplicating coding and thus the analysis (Creswell, 2013). In this research this was showed by how the many personal experiences invited for many different codes. For a next time, it might also be interesting to use open coding as a research method and let the data guide the coding process. Working with coding however did improve the research validity, by making the data analysis a repetitive process.

For a more complete data set, it is a regrettable that the researcher did not manage to include the third founder of Sustonable as a unit of analysis. Due to circumstances, at least two and a half months was in between the first and the last interview, which made quite a situation change for the respondents connected to Sustonable. In this period a big step in investment was made, which could have influenced the results.

It is important to note that however case studies are known for their ability to get an in depth understanding in a certain issue, it is difficult to translate the results to a broader perspective. For example, the technical nature of the startups make that these results cannot be extrapolated to non-technology-based startups, even if they serve an environmental issue.

8.3 RECOMMENDATIONS

Further work is required to establish the viability of this research, by finding theory that would fit a research on implicit motivations. Further study is recommended with more focus on how environmental entrepreneurs have been educated for, or have been immersed in, sustainable development. It is also recommended to study how non-environmental entrepreneurs constitute the concepts of sustainability and social responsibility, and how this influences their actions. Future research could also help in explaining how an environmental entrepreneur might have been influenced by experiencing the effects of environmental degradation first hand, as compared to observing from a distance.

Further study could focus on the conditions that could empower pioneers in sustainable innovation in an existing organization, that are frustrated by corporate culture and organizational inertia. It is also be worthwhile to study how universities encourage researchers to apply their, often valuable, research.

9 Reflection

In this chapter I will reflect on the process of preparing, executing and writing my bachelor thesis.

As a pre-master student, I felt a bit insecure in the beginning of the process. And to be honest, this feeling did not leave until the moment of finishing the process. I have learned many new things, especially about the way of writing arguments. The first rounds of feedback all had a sense of 'explain more' and 'do not cut too short', which made me very careful in explaining enough; as a result, my thesis is quite extensive in amount of words and details. I also learned a lot about consistent writing: how to consequently link back to the same concepts and principles.

I have learned a lot about academic research, learning by doing still works best in that sense. However, I feel like the research method that I chose to work with is quite difficult, which made me uncomfortable at times that I needed structure. Again, I found myself overcomplicating things that do not need to be overcomplicated, a characteristic of myself that I know very well. I did enjoy doing the interviews a lot, even though it was difficult to schedule them. I am however very critical on how I executed on them. Some of them were abroad and there simply was no other way than doing them over phone or skype. One of them was only available when driving to work, the result of the interview was fine, but a next time I will reconsider doing it like this. The interviews with the mentors were difficult, because it was still unclear how I was going to use their data, which made me insecure and not clear in my questions. So, interviewing in practice definitely is a point for improvement.

Something that I am very happy to look back on is the way I am able to analyze the data and to conclude from it. My research setup was not easy (qualitative, a lot of personal statements) but I did manage to find patterns and use it in a meaningful way. I would like to learn more about how to report the different qualitative research methods, this was a challenge.

With a background in business innovation and entrepreneurship (bachelor degree) I actually intended to focus on something completely out of the scope of business, yet I found myself studying a business issue after all. I feel like I should have stayed in control of my intentions more to learn more about different topics, but on the other hand it did give me the opportunity to already now make the connection between sustainable development and business, which I intend to do anyways in my master. It also was a relevant topic for my work, which made it interesting to explore and perhaps use some results in that context.

When I started reading articles and exploring the theoretic field of my topic, I was very excited, it is something I enjoy learning more about. I do think I was just a little to late learning how to find even more relevant articles; over time when already analyzing the results I got way more experienced and found theories and articles that would fit my research even better. But at this point in time, there was simply no way of incorporating this and I just had to get it out of my head. I found it very difficult to realize at a certain point that my theory did not very much fit my purpose, but I had to continue anyways. Sometimes that is what you do in order to learn, but it felt contradictory.

I am very sure that most of the challenges I have experienced are due to the fact that I did not enable the supervisor and fellow students to review me that often during the process, or at least nothing after the first case description. Crucial elements like the conclusion and the discussion are now based on my own experience and feedback from people that are involved in academic research, but not in social sciences like GPE. Because I am doing this pre-master next to a part-time job in the startup industry, it was very challenging to focus time on the research. At certain times, I missed out on more feedback because of this. And the fact that I was very lucky to be invited for a conference in Singapore for two weeks did not help in that respect either. I believe writing my thesis over summer was the most challenging time in my study career so far. I am happy that I am comfortable with asking people to help me by giving feedback, otherwise I would not have been able to do this I think.

A next time I will take more time to understand my research goal in respect to the theory. I believe that when I feel more certain about that, I feel more confident throughout the research (working with an existing framework could help for instance). A next time I will look for a research topic that is further away from my professional life, to avoid my own bias in the process.

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Appendix I: Interview guide

GENERAL INTERVIEW GUIDE	
Introduction	Next to my job at HighTechXL I'm currently also doing a premaster in Environment and Society Studies at the Radboud University in Nijmegen. For that study I'm doing research for my thesis about the motivations to start an 'environmental startup': a startup that has a product or services that contributes to solving the environmental issues known today. This is why I'm interviewing founders of startups that fit in that category, to find out what their motivations in this process are and how they interact.
Practicalities	The data will only be available for me and my supervisor, the thesis with the analysis of the data will be published in the RU database. Consent with recording the interview?
General, startups	<ul style="list-style-type: none"> - What did you do before you founded this start-up? <ul style="list-style-type: none"> - Was this a corporate/governmental/university environment? - Why did you leave that previous workplace/other? - What experience did you take onto your own start-up? - Can you tell me the story of how you began with your start-up? <ul style="list-style-type: none"> - Why did you create that solution? Why not before? Why now? Why didn't other people do this? - Why did you feel like starting a business around the topic? - How is the working environment that you're in now different from your previous experiences? - What are the key differentiators of your project? <ul style="list-style-type: none"> - Why are they key differentiators? - What market are you in with your startup? Why this market? - Can you tell me about difficult moments in beginning your startup? <ul style="list-style-type: none"> - Why were they difficult? - Who were involved in the process around you starting the business? Why these people? Were there people that became important later in the process? What did they bring you? - Can you remember (global/national) environmental shock events? <ul style="list-style-type: none"> - Why do you remember these? - Are there other aspects that we should discuss regarding this topic? - Who else should I talk to about the beginning of your start-up?
General, mentors	<p>How are you involved with team X?</p> <ul style="list-style-type: none"> - Why are you involved with the team? - How did you get to know team X? <p>How have you been mentoring the team?</p> <ul style="list-style-type: none"> - Why? - What were those coaching moments about? Why? <p>What sets startup X apart from other teams, according to you?</p> <ul style="list-style-type: none"> - What is their key differentiator? <p>What important choices did the team make?</p> <p>What steps forward did the team make?</p> <p>Where does the team need improvement?</p>

		HighTechXL: Why was the team selected for the accelerator program?	
TOPIC LIST			
Motives		Indicator	Questions
Entrepreneurial motive	Creative destruction	Interest in technological innovation	What is your connection to the technological solution?
		Interest in supplanting existing products	Can you tell me about the market you're in? Why are you in this market?
		Interest in creating new products / services	How was it to create a business?
	Taking risks	Low risk perception	How did you feel when beginning the business?
		Perception of failing as learning	Can you tell me about difficulties in the process of beginning the business?
		Positive towards uncertainty	What are things that you learned in this process?
	Start-up life	Need for an independent working environment, internal locus of control	What do you enjoy about your current way of working? Why do you enjoy that?
		Dissatisfaction with previous (non-startup) practices	Is this different from other experiences?
Environmental motive	Ethical concern	Will to give back to society	What is your companies place in society? What is your place in society?
		Will to challenge legitimacy of existing practices	
	Ecological concern	Reduce air, water and soil pollution and waste	What is important for a sustainable planet?
		Climate change resilience building	
		Resource efficiency measures	
	Stakeholder action	Change in paradigm in the company's specific industry	Can you tell about the market that your operating in? Are you involved with the government? Why?
		Withdrawal of stakeholders in established situation	
		Government involvement in the company's specific industry	

Appendix II: Codes

Family	Subfamily
Motivations	
Creative destruction	Creating new products
	Supplanting existing products (Ethical concern)
	Technological innovation
	+ Use science applied instead of research only (Ethical concern)
	+ Academic environment
	+ Potential impact (Ethical concern)
	+ Innovation is fun
Taking risks	Early stage absence of uncertainty
	Positive towards uncertainty
	Unanticipated effects are resource
	+ Trust in team
	+ Risk no pushback
Startup life	Independent working environment
	- Dissatisfaction previous practices
	+ Dissatisfaction (previous/prospective) practices_corporate workstyle
	+ Dissatisfaction previous practices _no personal development
	+ Dissatisfaction previous practices _not aligned with company vision
	+ Dissatisfaction previous practices _working alone
	+ Entrepreneurship solution to conservative industry
	+ Inspired by previous experience
Ethical concern	Social responsibility
	- Legitimacy issues
	+ Legitimacy issues_economic system
	+ Legitimacy issues_government (Stakeholder action)
	+ Legitimacy issues_traditional companies
	+ Legitimacy issues_tradition technologies
Ecological concern	Adaptation
	Pollution
	Resource efficiency
	+ Pollution affects humans (Ethical concern)
	+ Pollution affects sustainability of planet
	+ Environmental concern internalized
	+ Energy system is key in sustainable development
	+ Awareness
Stakeholder action	New consumer information
	Withdrawal of stakeholders
Case descriptions	
<i>Case description</i> <i>Applied Biotec</i>	<i>Process</i>
	<i>Value proposition</i>
	<i>Market choice</i>
	<i>Connection science and society</i>

	<i>Team</i>
<i>Case description</i> <i>Sustorable</i>	<i>Process</i>
	<i>Investors</i>
	<i>Market choice</i>
	<i>Patents</i>
	<i>Composite material</i>
	<i>Team</i>
<i>Case description</i> <i>HightechXL</i>	<i>Coaching</i>
	<i>New kind of innovation consultancy</i>