

The key success factors for green tech startups. The case study of Wiseair.

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Abstract

Title: The key success factors for green tech startups. The case study of the Italian-based startup Wiseair and the promotion of air-quality.

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In recent years, climate change has become an issue of utmost importance that has attracted global attention in an effort to find solutions to a problem that cannot be longer ignored. Comprehensive and integrated strategies that concurrently tackle social, economic, and environmental repercussions are required for immediate action. Technological innovation is a primary route for the elaboration of solutions that can strike a balance between the objectives of economic growth and sustainability. This dissertation analyzes the success story of Wiseair, an Italian-based green tech startup engaged in enhancing air quality through innovative and cutting-edge technologies. Through the examination of this the case-study, the research investigates how multiple external and internal factors, as presented in the theoretical framework, have contributed to the company's achievements. The findings offer valuable insights for a deeper understanding of how a green startup like Wiseair was able to effectively navigate the challenges and opportunities presented by its operational environment, leading to its noteworthy success in the sustainability sector.

Keywords: Green Technology – Green tech startup – Air quality – Sustainability – Entrepreneurship

Sumário

Título: Os fatores-chave de sucesso das startups de tecnologia verde. O estudo de caso da startup italiana Wiseair e a promoção da qualidade do ar.

Autora: Elena Foradori

Nos últimos anos, as alterações climáticas tornaram-se uma questão da maior importância que tem atraído a atenção mundial, num esforço para encontrar soluções para um problema que não pode continuar a ser ignorado. São necessárias estratégias abrangentes e integradas que abordem simultaneamente as repercussões sociais, económicas e ambientais para uma ação imediata. A inovação tecnológica é uma via primordial para a elaboração de soluções que possam estabelecer um equilíbrio entre os objetivos de crescimento económico e de sustentabilidade. Esta dissertação analisa a história de sucesso da Wiseair, uma startup italiana de tecnologia verde empenhada em melhorar a qualidade do ar através de tecnologias inovadoras e de ponta. Através da análise deste caso estudo, a investigação examina a forma como múltiplos fatores externos e internos, tal como apresentados no capítulo teórico, contribuíram para as realizações da empresa. As conclusões oferecem informações valiosas para uma compreensão mais profunda da forma como uma empresa verde em fase de arranque, como a Wiseair, foi capaz de enfrentar eficazmente os desafios e oportunidades apresentados pelo seu ambiente operacional, conduzindo ao seu notável sucesso no sector da sustentabilidade.

Palavras-chave: Tecnologia verde - Startup de tecnologia verde - Qualidade do ar – Sustentabilidade – Empreendedorismo

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1. Introduction

Climate change is happening and is widely acknowledged to pose a major threat to the sustainable development of human society and civilisation. Climate change and environmental degradation are complex phenomena that have far-reaching impacts on the planet and its inhabitants. According to the Intergovernmental Panel on Climate Change (IPCC, 2007), climate change is caused largely by human activities (i.e. anthropogenic) and is occurring at a much faster pace than has previously occurred naturally. The effects of climate change are being felt across the world, from rising sea levels and melting glaciers to more frequent and extreme weather events like hurricanes, floods, and droughts. These changes not only threaten the survival of many species, including ours, but also have profound implications for human health, food security as well as economic and socio-political stability.

There is, however, solid scientific evidence that the adverse effects of climate change can be mitigated, postponed, or even averted through the reduction of greenhouse gases. Green tech technologies have emerged as a promising solution to address the effects of climate change, promote sustainability, and create a more resilient future. Green technologies can be described as those that generate power from renewable, sustainable sources or reduce adverse human environmental impact (Christensen et al., 2011), creating value using fewer resources and emitting less pollution than traditional alternatives (Marra, Antonelli and Pozzi, 2017).

These technologies are now developed and used by the so-called “GreenTech”, “cleantech”, “eco-tech” or “enviro-tech” startups, which are created to reduce the environmental impact of human activities with new technologies (Hoff, 2012). Many green tech startups, however, face significant challenges in establishing themselves on a very competitive market, scaling their solutions and achieving success.

The purpose of this thesis is to identify the key success factors for green tech startups and to provide guidance for green tech startup founders, investors, and policymakers to support the growth of these companies and promote sustainability.

To achieve this goal, the thesis will focus on the case study of Wiseair, an Italian-based startup that promotes air quality through innovative solutions. Their advanced sensors and data-driven solutions empower cities, communities, and individuals to combat air pollution effectively.

Since Wiseair is headquartered in Milan and currently provides its quality monitoring and data analysis services to numerous cities and municipalities in the sole Italian territory, the thesis scope of analysis will be limited to the Italian context.

Through this case-study, the dissertation seeks to answer the following overarching teaching question: **What are the key success factors for green tech startups?** Additionally, the dissertation will deal with the following teaching questions:

1. How does Wiseair successfully integrate sustainability objectives with economic goals?
2. What challenges might Wiseair encounter in the B2B market, and how can these be overcome? Start by conducting a SWOT analysis for the B2B service.

To address the various issues and questions above mentioned, this dissertation is structured into seven additional chapters.

The first chapter is an extensive literature review, exploring the concept of green tech startups and illustrating how green entrepreneurs can effectively establish environmentally sustainable organizations.

Following this, the chapter is dedicated to the methodology employed for this study. This will include an interview with Andrea Bassi, co-founder and Head of Sales at Wiseair to gain an in-depth understanding of Wiseair's operations, culture and vision.

Chapter four delves into a detailed case study of Wiseair. This will encompass its history, strategic approach, as well as its working methods and the new B2B challenge. The chapter will also shed light on the company's culture and primary activities, including logistics, partnerships, packaging strategies, and marketing and sales efforts and future steps and goals.

Following this, chapter five and six offer an overview of the context in which Wiseair operates, i.e. Italy. This section will include an analysis of air pollution regulations and compliance within the country. Additionally, it will explore the broader landscape of investments in green startups and the startup environment in Italy. Moreover, a subsection will be dedicated to Wiseair's partnership with ARPA (Regional Agencies for the Protection of the Environment) Sicily.

The seventh chapter is centred on the analysis of teaching notes. This section will contain guidelines for instructors and provide a framework that clarify how students should approach and respond to the teaching questions.

The final chapter will bring the dissertation to a close. It will summarize the business case of Wiseair, provide concluding remarks on the case study and suggest potential directions for future research.

2. Literature Review

In recent years, there has been a surge of green-tech startups that specialize in developing and commercializing green technologies. These startups provide innovative and sustainable solutions to environmental problems while also creating profitable businesses (Sàez-Martínez et al. 2016). However, the fate of these startups is not guaranteed, and numerous factors and variables can determine their success or failure.

To assess this phenomenon, a growing field of inquiries has developed. This section provides a review of the existing literature on green technologies and green-tech startups, with a particular focus on the key question of success vs. failure. By examining the current state of research, this section will also provide valuable insights and recommendations for entrepreneurs, investors, and policymakers interested in the green-tech sector.

2.1 Green Technologies

2.1.1 Definition of Green Technologies

Despite the green technology market being relatively young, it has generated considerable attention and interest from researchers and investors due to the increasing awareness of the adverse effects of climate change (Ametepey et al., 2015). The resulting academic literature on green technologies has focused its initial line of inquiry on defining the key concepts and terms. Indeed, the term “green technology”, or “environmental technology” or “clean technology”, is a broad notion that encompasses various technologies and services that aim to promote sustainable development (Bergset, 2015). As a result, the definitions of green technology vary across countries and industries. The focus of these definitions is typically on the outcomes of green technology, rather than describing the technology itself.

A commonly cited definition is provided by the US National Science and Technology Council (2012), whereby green technology is described as a specific form of technology that promotes sustainable development by achieving four objectives: 1) reducing risk; 2) enhancing cost-effectiveness; 3) improving process efficiency; and 4) creating products and processes that are environmentally beneficial or benign (Hoff, 2012).

Another more precise definition has been provided by Pernick and Wilders (2007, 9-10), who refer to cleantech as “any product, service, or process that delivers value using limited or zero non-renewable resources and/or creates significantly less waste than conventional offerings”. The goal of clean tech is, therefore, to reduce reliance on non-renewable resources by

harnessing renewable materials and energy sources more efficiently and productively. Additionally, clean tech seeks to reduce or eliminate pollution and toxic waste while maintaining or exceeding the performance of traditional offerings (ibid.).

In short, in Pernick and Wilders' view, the term green technology refers to a range of technologies and industrial services that are designed to develop solutions that minimize waste and maximize efficiency to reduce the environmental impact of industrial processes. By using these technologies and services, businesses can work headway towards sustainability and mitigate the negative effects of their operations on the environment.

2.1.2 Types of Green Technologies

Given this definition, scholars and practitioners have sought to elaborate a typology of green technologies. The adoption and development of green technology face several obstacles (Murillo-Luna et al., 2011; Luthra et al., 2015; Xia et al., 2019), in terms of policy (Yoshino et al., 2019; Darko et al., 2018; He et al., 2019), market (Campiglio, 2016; Agyemang et al., 2018), knowledge and awareness (Darko et al., 2017; Liao and Shi, 2018), and financial barriers (Wakeford et al., 2017; Ji and Zhang, 2019; Bhandari et al., 2019). A major challenge is the absence of a standardized classification system for green technology, which leads to uncertainty and confusion in choosing appropriate technologies (Ru Guo, 202). As seen before, green technology is a complex and dynamic concept, covering different fields, and the lack of uniform guidance hinders its large-scale transfer.

Guo et al. (2020) have elaborated the most sophisticated and actionable classification system of green technology (CSGT), whereby green technology can be divided into five major categories: 1) environmental quality; 2) resource utilization; 3) energy use; 4) life health, and 5) ecological security. The first three categories focus on immediate challenges, while the last two categories focus on the ultimate goals of sustainable development.

2.1.3 The Green Tech Market

A great deal of research has been also devoted to the study and assessment of the market of green technologies. According to market research (Statista, 2023), the global green technology and sustainability market are projected to significantly grow between 2021 and 2030. This market encompasses a wide range of sectors and products that focus on reducing environmental impact and promoting sustainable practices. As shown in the graph below, the market size of

green technology will expand in the next decade. The size of this market in 2021 was estimated to be approximately 35.5 billion US dollars, and it is expected to continue to grow over the next decade reaching 417.35 billion US dollars in 2030 (Statista, 2023).

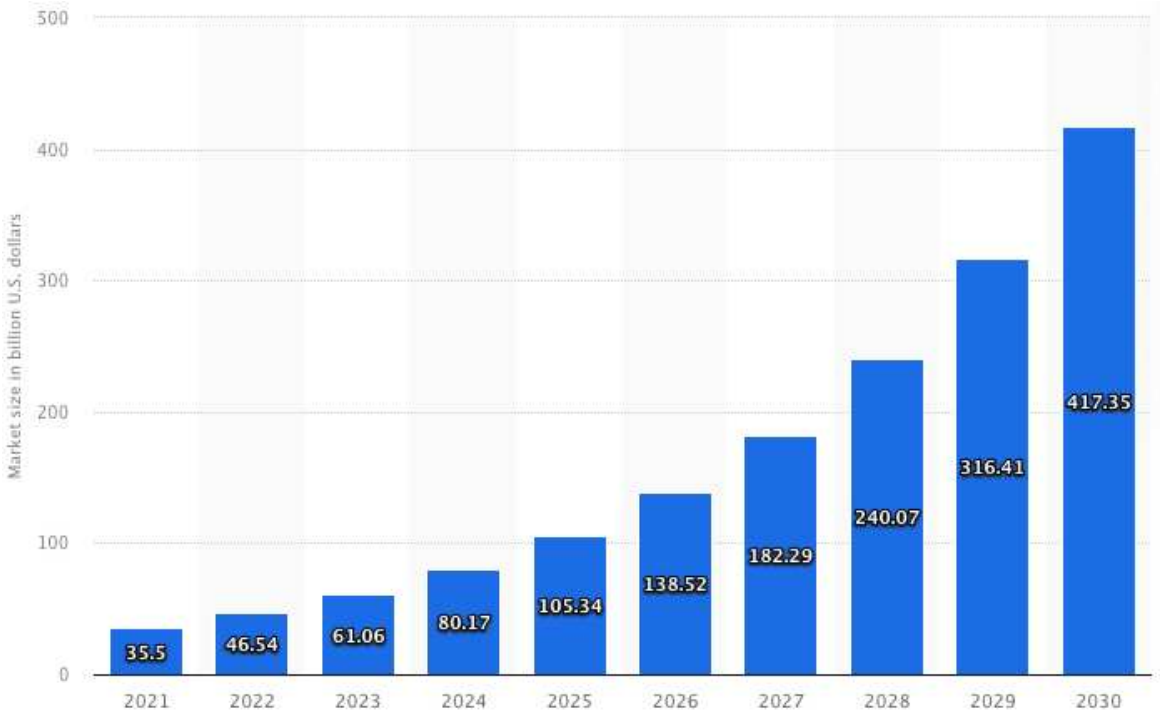


Figure 1: Green Technology and Sustainability Market Size Worldwide from 2021 to 2030 (in billion US dollars), Statista (2023)

2.1.4 SWOT Analysis

The market under discussion is set up for a bright future. To gain a complete understanding of the market’s current and future position in the industry, it is key to conduct a comprehensive SWOT analysis that evaluates its strengths, weaknesses, opportunities, and threats (Namugenyi et al, 2019).

As Thompson et al. (2007, 97) would describe, “SWOT Analysis is a simple but powerful tool for sizing up an organization’s resource capabilities and deficiencies, its market opportunities, and the external threats to its future”.

The SWOT method creates a 2x2 matrix that identifies the internal strengths and weaknesses of an organization or project, as well as external opportunities and threats presented by the environment (Helms and Nixon, 2010). This method is a powerful tool that enables decision-makers to make informed decisions (Vladi, 2014).

Strengths refer to internal capabilities and positive aspects that help companies achieve their goals (Eastwood et al., 2016; Burstein et al., 2008). Weaknesses, on the other hand, are internal

factors that could negatively affect the company's performance (Christine Namugenyi et al., 2019). Opportunities are external factors that can favor businesses with links to outside organizations. They are external factors through which companies can exploit their advantages (Eastwood et al., 2016). Threats are negative external factors that can hinder or delay the company from achieving its goals (Christine Namugenyi et al., 2019).

SWOT method is widely accepted as a useful tool in decision-making (Kotler, 1988; Wheelen and Hunger, 1995) and is commonly used for defining an organization's strategic action. However, as Coman and Ronen (2009) point out the SWOT analysis presents some flaws. Firstly, there is no straightforward methodology for identifying strengths and weaknesses. Secondly, strengths and weaknesses are not ranked hierarchically, and there is no clear indication of causality. Finally, the SWOT analysis is often a one-time event, meaning that there are no mechanisms for monitoring changes over the longer term.

2.1.5 SWOT Analysis of Green Technology Application for the Development of Low Carbon Cities

As mentioned before, it is crucial to conduct a SWOT analysis to evaluate the strengths, weaknesses, opportunities, and threats associated with the application of green technology. The following SWOT analysis has been drawn from a recent paper published by Mustaffa and its associates (Mustaffa et al., 2022). This paper focuses on the application of green technologies in the context of low-carbon cities. As highlighted in the article, the rapid pace of urbanization, fuelled by a variety of human activities, "is the foremost driving factor towards climate changes" (ibid., 1). Also, urban development, coupled with population expansion, is posing considerable threats to living conditions, and the environment, and is causing the degradation of ecosystems. According to the United Nations, over half of the world's population lives in cities as of 2018, and by 2050, this is projected to increase to 68%.

The paper presents the results in a form of a ranking, from the most important factors to the ones that are perceived to be less crucial in the application of green technology for the development of low-carbon cities.

The analysis shows that the factors that are deemed to be the most important for promoting green technology adoption in low-carbon cities are financial incentives from the government, government support and initiatives in green technology adoption, and a competent and proactive green technology promotion team and local authority. Other important factors include a strong green technology policy framework and extensive promotion by the government to

encourage its adoption. Another factor that is not considered to be as important as the other is participation from financial institutions.

The most significant factors that hinder the development of green technologies are unfamiliarity and lack of understanding of green technologies, followed by the lack of interest from clients and market demand. Other weaknesses include a lack of motivation and enthusiasm from agencies to participate in low carbon cities development, limited knowledge and information on the availability of green technology and suppliers, and a lack of technical skills and expertise in green technology (Mustaffa et al., 2022).

Opportunities that can favour businesses with links outside organizations include technology transfer, which is part of promoting economic development through commercializing innovative technology. One should also include creating new eco-friendly products and services, having a strong business market, and job creation opportunities. In addition to the before mentioned tangible benefits, there are also important intangible benefits in terms of the environment and society. These benefits include reducing carbon emissions, energy, and waste, conserving natural resources, and improving health and comfort (Mustaffa et al., 2022).

However, the green technology market faces several threats that could hinder its growth and success. The external threats to incorporating green technology in low-carbon cities are the high initial investment risk with a long payback period, followed by the complexity of green technology. Other factors that pose threats include an insecure green technology market, economic uncertainty, and a lack of drive from industry associations that are not green-conscious (Ibidem).

<p>Strengths</p> <ol style="list-style-type: none"> 1. Financial incentives from government 2. Government support and initiatives in green technology adoption 3. Competent and proactive green technology promotion team and local authority 4. Green technology policy framework 	<p>Weaknesses</p> <ol style="list-style-type: none"> 1. Unfamiliarity and lack of understanding on green technologies 2. Lack of knowledge and information on availability of green technology and supplier 3. Lack of interest from client and market demand 4. Lack of technical skills and expert on green technology
<p>Opportunities</p> <ol style="list-style-type: none"> 1. Technology transfer 2. Create new eco-friendly product and services 3. Job creation opportunity 4. Strong business market 	<p>Threats</p> <ul style="list-style-type: none"> • High initial investment risk with long payback period • Complexity of green technology • Insecure green technology market • Economic uncertainty

Table 1 The green technology market faces several threats that could hinder its growth and success (Mustaffa et al., 2022).

2.1.6 Green Technologies as Companies' Drivers of economic growth

The nexus between sustainability and economic growth is at the core of the literature on green technologies. The focus on sustainability offers investors, companies, and customers the potential for increased returns, reduced costs, and lower prices. Furthermore, the adoption of clean technology can create quality jobs across all levels of management, production, and deployment (Pernick and Wilder, 2007).

According to research conducted by Gagliardi et al. (2016), new green technologies may have higher costs but could provide firms with additional returns when compared to non-green technologies. This argument is supported by three separate research streams.

Firstly, Malerba (2005) and Oltra and Saint Jean (2009) extend the debate on Schumpeterian innovation regimes to the green realm. They argue that eco-innovators may be more effective in their “creative accumulation” of knowledge. As a result, eco-innovators may have the ability to translate economic returns into higher growth opportunities.

Investing in green-specific assets, and acquiring green knowledge, and environmental technologies lead to more persistent eco-innovation practices and better outcomes. Compliance with environmental regulations is irreversible, making it necessary to invest in green technologies. These investments offer greater opportunities for increasing returns and growth (Sàez-Martínez et al., 2016; Chassagnon and Haned, 2015).

Furthermore, eco-innovators could benefit from the green-specific mechanisms that enhance firm profit. Such mechanisms can boost firm revenue through means such as green differentiation of products, accessing green demand segments, and selling environmental control technologies while reducing costs (Ambec and Lanoie, 2008). This, in turn, could translate into improved financial indicators (e.g. Misani and Pogutz, 2015) and greater profits (Misani and Pogutz, 2015), leading to higher growth opportunities.

Moreover, the regulatory push/pull effect can drive green tech. This effect, which involves regulations and policy actions that promote firms to adopt eco-innovations, has also been found to drive growth for green technologies. For example, governments can impose emissions standards, provide incentives for the use of renewable energy sources, or offer tax breaks for firms that adopt eco-friendly practices. These regulations force polluting firms to improve their environmental performance, and to do so they have to create a market for green technologies. Upstream producers of green technologies can benefit from the derived demand, leading to further growth opportunities (Colombelli et al., 2015; Ghisetti and Quatraro, 2013). Therefore, green technologies could provide firms with extra-economic returns that could be translated

into higher growth opportunities, thus providing a significant advantage over non-green technologies.

Overall, the push/pull effect of regulations is crucial for fostering eco-innovation and sustainable economic development. Regulations, laws, and markets for green products and technologies can incentivize businesses to invest in eco-innovation and offer a route for the transition to a more sustainable economy.

2.1.7 Digital Innovations and Green Technologies

Inevitably, the literature on green technologies is linked to that digital innovations (Weaver, 2000). As Weaver (2000) explained, the evolution of sustainable business models is closely influenced by macro trends such as the Internet of Things (IoT), Big Data analytics, Artificial Intelligence, and Machine-to-Machine (M2M) technology. These technologies have enormous potential in facilitating the adoption and implementation of sustainable practices in various sectors. The IoT, for example, can be leveraged to monitor and control energy consumption or to track soil, water, and air quality. Big Data analytics and AI can help identify, mitigate, and manage environmental risks in supply chains. The combination of digital and green technologies can unlock new opportunities for businesses to operate more sustainably.

2.2 Green-Tech Startups

As mentioned before, the threat of climate change has become one of the most pressing global issues of our time (Reckien et al., 2018). However, global problems often bring opportunities, especially for entrepreneurs capable of creating value out of the solutions they develop to mitigate those problems (Sàez-Martínez et al., 2016). In the academic debate surrounding entrepreneurship, a commonly held belief is that the greater the magnitude of a problem, the greater the potential for entrepreneurial action (Kuckertz and Wagner, 2010).

Technological advancements and the pursuit of innovation have opened up paths for entrepreneurs to play a significant role in mitigating the effects of climate change (Hall et al., 2010; Pacheco et al., 2010). The scope of entrepreneurial action in addressing this global issue is enormous, as innovative solutions and sustainable business models can effectively contribute towards a more sustainable future.

The current research on innovation and corporate sustainability has focused on large companies, as they have the necessary administrative systems and corporate reputation motives for

sustainability reporting (Bos- Brouwers, 2010). Green technologies are likely to originate from large and established firms, but many of the most innovative and disruptive technologies in high-tech industries are often pioneered by startups (Grant, 2018).

While established companies tend to invest in incremental innovation, radical innovation is more likely to come from smaller, entrepreneurial firms. This is also true for sustainable innovation (Fichter and Weiß, 2013): startups can have a significant impact in transitioning towards a sustainable or green economy (Baumol 2010).

According to Bos-Brouwers (2010), although smaller-sized organizations may lack resources, have a lower formalization, public visibility and reporting priorities, their dynamic and entrepreneurial management style, as well as the proximity of the manager/owner/founder to the innovation process, can drive sustainable innovation.

Additionally, according to Osukoya (2007), small firms possess several advantages in adopting environmental practices as compared to large firms. They have a higher likelihood of being viewed as environmentally conscious by consumers, and they are better equipped to respond actively to the growing demand for green products and services in various market segments.

However, like any startup, they are limited in operational and financial resources and suffer from poor market access and limited brand awareness (Aldrich and Auster, 1986).

This leads to small pioneering firms struggling to become dominant once the industry has reached maturity. Technology-focused startups often fail, with as many as 10% eventually having to file for bankruptcy (Startup Genome, 2019). Additionally, 70- 80% of tech-focused startups fail to deliver predicted returns on investment, while as many as 90- 95% fail to meet their own declared projections (Nobel, 2011).

2.2.1 Definition of Startup

Startups are often perceived as innovative businesses created by visionary young entrepreneurs (Eisenmann et al., 2011; Paternoster et al., 2014). However, the definition of a startup remains vague and is frequently confused with the early stages of a business. The concept of startup has yet to be clearly defined (Eisenmann et al., 2011; Paternoster et al., 2014).

According to Eisenmann et al. (2011), a startup is a company that is created to introduce new products into the market. Ries (2011) characterizes startups as firms that are designed to develop new products or services under circumstances of considerable market uncertainty. Similarly, Blank (2007) argues that the main goal of a startup should be to identify a business model that is both scalable and capable of being replicated.

Although there is no consensus on the definition of a startup (Santisteban et al. 2021), it is generally agreed that startups are small, innovative, and characterized by high risk and the potential for rapid growth (Garcia-Muiña and Navas-López, 2007, Konsek-Ciechonska, 2019). They are also known for having a scalable business model (Krejci et al., 2015, Prohorovs et al. 2018). Therefore, using the definition provided by J. Santisteban et al. (2021), a startup can be defined as a dynamic and flexible company that takes risks and provides innovative products and/or services, while having the potential for rapid growth through a scalable business model.

2.2.2 Definition of Green-tech Startup

Sustainable entrepreneurship is “an innovative, market-oriented and personality-driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations” (Schaltegger and Wagner, 2011). Sustainable entrepreneurship can unfold in established companies (incumbents) as well as in emerging and young companies (startups).

Entrepreneurs who are committed to sustainability focus on managing the “triple bottom line”, which includes balancing economic health, social equity, and environmental resilience through their entrepreneurial activities (Bergset, 2015, Elkington, 1997; Kuckertz and Wagner, 2010). Sustainable entrepreneurship aims to sustain nature, ecosystems, and communities while generating gains for individuals, the economy, and society (Shepherd and Patzelt, 2011).

According to Bergset (2015), the business of green-tech startups can be categorized into three main aspects: product-related characteristics; entrepreneur-related characteristics; and strategy-related characteristics. More into detail, product-related characteristics relate to the fundamental question about whether goods or services offered by the startup are green or not, i.e. to what extent these goods or services offered by the startup have a positive environmental impact. While some may consider the existence of a separate “green” or “cleantech” sector, it is important to note that green products and services can be offered across various sectors. To determine the greenness of a product, it is crucial to assess its potential environmental impact. The EU statistical office Eurostat has developed a classification system for the “Environmental Goods and Services Sector,” which covers all business activities related to achieving seven overarching environmental goals. These goals include renewable energy, energy and resource efficiency, circular economy, waste management, emission reduction, climate protection, and biodiversity and ecosystems. Therefore, product-related characteristics of startups provide insights into the extent to which they can contribute to achieving these environmental goals.

Entrepreneur-related characteristics looks into the modalities entrepreneurs contribute to the greenness of their startup's activities. In the sustainable entrepreneurship literature, many authors focus on the impact of entrepreneurs' motivation (Gray and Balmer, 2004), values (Parrish, 2010), and attitudes (Kuckertz and Wagner, 2010) on sustainability-related issues within their companies. Other relevant dimensions include the technical, business-related, and sustainability-related qualifications and knowledge of the entrepreneur (Choi and Gray, 2008). Finally, strategy-related characteristics consider how different strategies can strengthen or weaken the sustainability of a company. It is important to highlight that a startup's strategy is shaped by more than just the founder's values and desires. The strategy is formed through ongoing interactions between the company's founders and managers and external stakeholders, including investors, suppliers, and customers.

2.3 Theoretical Framework: Green Entrepreneurship (GE) And Green Value Added (GVA)

A valuable framework for the topic of this dissertation is the article by Nelson Oly Ndubisi et al. *Green Entrepreneurship (GE) And Green Value Added (GVA): A Conceptual Framework* (2009). The theoretical framework of this dissertation draws heavily from this article. This paper offers a conceptual framework that explores the relationship between green entrepreneurship (GE) and green value added (GVA), and their implications for small and medium-sized organizations. The authors argue that GVA, which is a measure of the environmental impact of a company's operations, can be an ideal platform for small and medium-sized organizations founded by green entrepreneurs. The paper provides an important contribution to the literature on green entrepreneurship and a conceptual framework can be used as a basis for further research in this area. This key contribution is unpacked in the next paragraphs.

Addressing environmental issues has become crucial for the survival and prosperity of any business (Baker and Sinkula, 2005). However, many businesses continue to view green practices as fragmented functions, rather than implementing green business practices as a comprehensive business philosophy and culture that can lead to an enhanced firm performance (Nair, 2004; Baker and Sinkula, 2005) and added value.

This paper proposes the adoption of the concept of Green Value Added (GVA) as a mean to develop a basic green business culture that increases firm performance and adds value to stakeholders, while also protecting the natural environment.

The authors use Porter’s (1985) Value Chain model as the basic premise for developing the GVA process model, and views entrepreneurs as a conduit for introducing GVA, as they are capable of bringing in innovative and revolutionary changes to businesses (Ndubisi, 2004).

In the article, two models are discussed: the GVA system model and the GVA process model. The first is a simple framework that depicts how GVA is developed and how it adds value to stakeholders and the natural environment. The second, the GVA process model, is a detailed version of the GVA process.

2.3.1 Green Value Added (GVA)

As Banerjee (2002) states, if entrepreneurs wish to build a “Sustainable Corporation” they need to integrate “environmental and social issues” to achieve long term shareholder value. However, addressing environmental problems cannot be achieved through economic and technological factors alone, as cultural, behavioural, and institutional factors must also be considered. Thus, GVA is developed in a culture of green entrepreneurship (GE), which promotes green desires and behaviours, with the support of well-developed pro-green institutions and stakeholders.

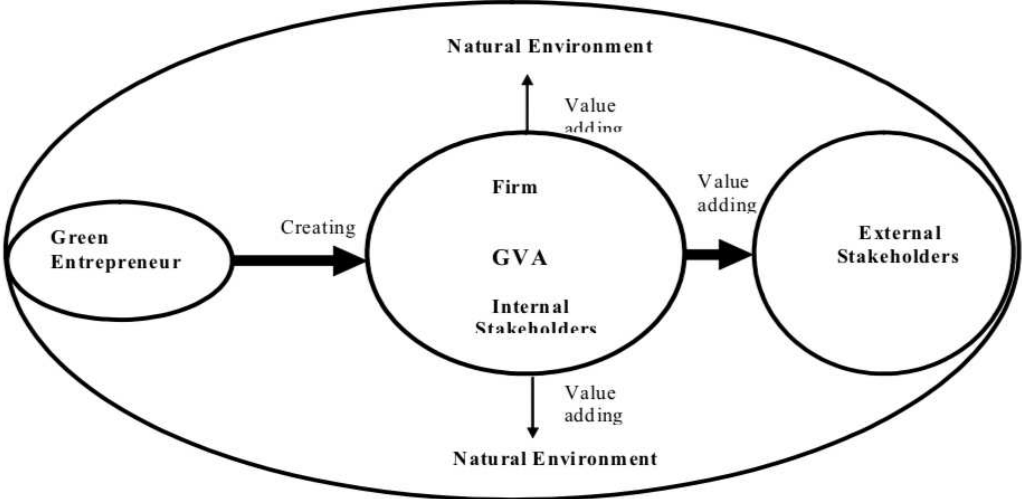


Figure 2 The GVA System Model

2.3.2 The GVA System

The GVA systems framework is a model that illustrates how green entrepreneurs can establish an environmentally sustainable organization by incorporating GVA as a guiding philosophy. The ultimate goal of GVA is to achieve all the organization’s objectives in a sustainable and environmentally friendly way. This means that GVA still prioritizes objectives like profit maximization and shareholder value maximization, but it does so in a way that does not compromise the organization’s environmental commitments.

2.3.3 The GVA Process

The GVA process is based on the value chain model proposed by Porter (1985), as illustrated in Figure 2. This process involves adding Green Value to both primary and support activities of the value creation process, in order to create a more sustainable and environmentally friendly organization. The next few pages will explain in detail how this process unfolds.

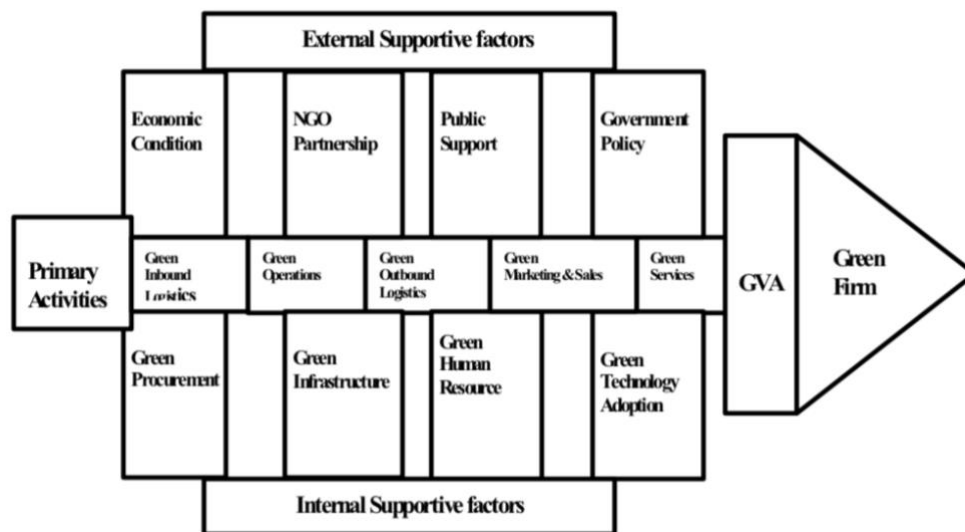


Figure 3 The Green Value Added (GVA) Process

Primary activities

Green inbound logistics

Inbound logistics involves receiving materials from suppliers and storing them until they are ready for use. To achieve eco-efficiency in these activities, it is important to consider transportation, material handling, storage, and warehousing practices.

By developing good relationships and better connectivity with suppliers, the company can better implement environmentally friendly practices. Moreover, implementing e-logistics systems can help manage logistical issues and reduce costs in material handling and storage, which can increase market competitiveness and sustainability (Sarkis et al., 2004).

Regarding transportation methods, it is important to select modes of transportation that align with the company's green initiatives and that make this activity more energy-efficient and pollution-free. It is crucial to select transport service providers who are aware of and support the business's green initiatives because they can help create environmentally friendly transport services in the long run.

Effective material handling and storage can also contribute to better eco-performance. Changes in the mode and method of packing, such as using bulk packing and recyclable packing materials, can save money in material handling (Wu and Dunn, 1995). Moreover, solar-powered warehousing facilities are compatible with firms' green storage and warehousing objectives and can form an important criterion for choosing service providers.

Green operations

Adopting an environmental management system (EMS) standard, such as ISO 14001, can help incorporate environmental management into a company's daily operations and long-term strategic planning (Chavan, 2005). Studies have shown that the implementation of an EMS can improve environmental performance (Theyel, 2000), and can ultimately result in cost reduction (Zutshi and Sohal, 2004), as it standardizes a firm's operations. Innovative use of appropriate environmental technology in production and operations can also further improve the performance of an EMS.

According to Pun (2004), there are six major tools for environmental responsible operations (ERO) in green manufacturing: 1) life cycle assessment; 2) green quality function deployment; 3) design for recycling and remanufacturing; 4) green purchasing; 5) green material requirements planning; and 6) green supply chain. Most of these tools are integral components of an EMS standard like ISO 14001 and have overlapping effects on other green value chain activities.

Green outbound logistics

Outbound logistics is responsible for distributing finished products and services through various technologies such as transportation, material handling, and packaging.

To make this activity more sustainable, companies can make use of innovative distribution systems and appropriate information and communication technologies. The strategies discussed earlier for achieving efficiency in transportation, material handling, and storage under inbound logistics are also relevant and can be applied to outbound logistics (Wu and Dunn, 1995).

To make outbound logistics more eco-friendly and more sustainable, firms can encourage distribution partners to adopt and implement the firm's environmentally friendly activities (Nair, 2004, Ndubisi and Chukwunonso, 2008). Also, developing a vertical green marketing system (VGMS) can help create a green network between the firm and its distribution partners to improve eco-performance.

Green Marketing and Sales

The role of green marketing and sales in the GVA is crucial as it has a significant impact and influence on other activities. According to Charter (1992), green marketing is a responsible and holistic strategic management process that identifies, anticipates, satisfies, and fulfills stakeholder needs in a sustainable manner, without harming human or natural environmental well-being.

As customers are the most important and critical stakeholders, green marketing should focus on and prioritize communicating and educating them on the firm's green initiatives.

As suggested by Banerjee et al. (2003), green marketing should ideally have an internal and external orientation, catering to the needs of internal and external customers separately. Internal green marketing initiatives should collaborate with Green Human Resources Management (GHRM) to educate and involve employees and management in green practices, which will be discussed later in the paper. On the other hand, external green marketing initiatives should be part of a well-defined strategy to establish effective communication channels to connect with major external stakeholders to identify, develop and deliver their needs in the most environmentally friendly way possible.

Green firms often share the responsibility for how customers acquire, use, and dispose of products supplied to them. By assuming shared responsibility with customers, they can motivate them to use biodegradable materials, implement recycling projects, and adopt waste management initiatives contributing towards a sustainable GVA.

Green services

The firm's commitment to GVA may require further support services for green customers, particularly in the initial stages when innovative green products are firstly being introduced into the market.

It is typical for important stakeholders to have reservations and scepticism regarding the firm's GVA initiatives, and it is the green services' duty to increase awareness of GVA by, for instance, planning educational and training sessions on the subject.

In essence, in order to enable the best use of green products and a better knowledge of the environmental commitments made by green entrepreneurs, green services should offer exceptional support services to both customers and stakeholders.

Internal Support Activities

Green Infrastructure Development

The development of green infrastructure is crucial for creating an environment that, in a delicate balance, supports economic growth while also prioritizing environmental sustainability. This requires a focus on the organizational structure, control mechanisms, and culture of a firm.

Green entrepreneurs should foster a culture where everyone acknowledges environmental improvements as an economic and competitive opportunity, rather than as a cost, or a threat.

To ensure that green infrastructure is flexible enough to adapt to changing environmental requirements, environmental-friendly entrepreneurs must consistently seek ways to improve performance. This includes developing infrastructure that supports primary green activities and other green internal supportive initiatives. One way to do this is to seek professional advice from environmental management consulting and auditing firms to ensure effective implementation.

Green Human Resource Management

As before mentioned, green human resource management (GHRM) is a critical aspect in creating a workforce that understands, values and practices green value-added (GVA). GHRM should ensure that its green objectives are integrated and mainstreamed throughout the process of recruitment, hiring, training, compensation, development, and advancement of the company's human capital. By exposing employees to a strong green culture from the onset, it is possible to develop a green workforce that will be the driving force behind GVA, providing the company with a sustainable competitive advantage. GHRM can identify potential green employees during the hiring process by evaluating their environmental awareness, interest in environmental advocacy, and prior experience in green projects. During the training phase it is

important to develop training programs that aim to create awareness, interest, motivation, and skills to contribute to the company's GVA initiatives. The employees that demonstrate a strong commitment to these initiatives should be recognized and rewarded with career advancement opportunities. Moreover, having strong green entrepreneurial leadership is crucial. The founder, owner, or manager can contribute to fostering a green workplace culture and raising employee awareness of environmental issues.

Green technology adoption

For a green entrepreneur, adopting green technology is not only a natural choice but also a crucial factor in supporting green primary activities. Research has shown while the initial cost of implementing green technology may be higher, it ultimately reduces costs in the long run (Porter and Van der Linde, 1995).

This paper uses the definition given by Srivastava (1995), that describes environmental technologies as production equipment, methods, and product designs that conserve energy and natural resources, minimize the environmental impact of human activities, and protect the natural environment. Environmental technology should be viewed both a technology and management orientation, with hardware (e.g., pollution control equipment and ecological measurement instrumentation) and software (e.g., waste management practices and conservation-oriented work arrangements). Both the hardware and software aspects should be seen as an integral part of the green management practices of the firm to achieve better, cost-effective results in a competitive manner. Tools like Total Quality Environmental Marketing (TQEM) can be utilized to effectively implement environmental technologies (Banerjee, 1998; Hartman and Stafford, 1998).

Green Procurement

Green procurement is another crucial aspect of a firm's effort to prevent environmental issues that may arise in the future. Careful sourcing of raw materials through green procurement can significantly reduce pollution and waste, making it a vital element in GVA. Effective source reduction and positive relationships with suppliers are equally important for GVA.

Source reduction can improve resource productivity by substituting expensive materials and utilizing existing ones more effectively (Porter and van der Linde, 1995). This can also help the organization to avoid or minimize the use of depleting resources and can encourage the use of recyclable, biodegradable, photodegradable, and compostable resources.

Establishing long-term and high-quality relationships with suppliers is essential to achieve these goals. No green initiative is complete without a firm's supply chain partners that are neither green nor willing to go green (Nair and Menon, 2008). To this end, a green entrepreneur can arrange environmental education and training for their supply chain partners and also make efforts to do business with green suppliers. Many studies have demonstrated the positive outcomes of a green supply chain relationship between the manufacturer and their supply chain partners (e.g., Simpson, 2007). Therefore, green procurement is of great importance among business activities and has an organization-wide impact on green performance.

External Support Activities

Indirectly, external factors also contribute significantly to the successful implementation of GVA. There may be other factors that can influence GVA, but economic conditions, NGO partnerships, public support, and government policies are considered to be the most significant.

Economic Condition

Studies have consistently shown a positive correlation between favorable economic conditions and the adoption of environmental initiatives (Ndubisi and Chukwunonso, 2005; 2008), as well as the performance of green businesses (Baker and Sinkula, 2005). Green entrepreneurs are more likely to establish and develop green firms in an environment that is conducive to their success. Additionally, when economic conditions are favourable, consumers are more likely to show an affinity towards green products, as they have greater disposable income to invest in innovative, eco-friendly products. Therefore, favourable economic conditions can be considered a significant external factor that supports the successful implementation of GVA.

NGO Partnership

Establishing a green alliance (Stafford et al., 2000) with environmental NGOs can be highly beneficial for green entrepreneurs in achieving their environmental goals effectively. This partnership can help and facilitate the establishment of relationships with other important stakeholders (Polonsky, 1995; Stafford and Hartman, 1996; Stafford et al., 2000). Also, it can provide valuable environmental expertise (Stafford and Hartman, 1996; Stafford et al., 2000) to support the activities and functions of the green organization.

Both the knowledge base and the network system that the NGOs have can prove to be valuable for the success of green entrepreneurial startups. Therefore, a green alliance with environmental NGOs can be considered as a crucial external support factor for GVA.

Public Support

Public support and regulations can have a positive impact on green initiatives and green entrepreneurship (Epstein and Roy, 2000). Green entrepreneurs require the support of the community and public to succeed in their GVA ventures. The public is generally supportive of green initiatives that create jobs and protect the natural environment, so it is important to conduct an initial public relations campaign to educate the public. This can help ensure their support and engagement, as they can become partners and customers of the green entrepreneurial venture. The success of green ventures heavily depends on gaining public support, as the public forms the market for and is a major stakeholder of green initiatives.

Government Policy

Most of the governments in the world perceive environmental protection as a priority issue, resulting in the development of carefully developed environmental policies and regulations to preserve the natural environment. Such policies create an ideal environment for the development of environmentally friendly business practices, such as green entrepreneurship. Governments can incentivize and reward firms that excel in environmental initiatives through the creation of industry policies and regulations. Such measures will promote economic growth through job creation, innovation, and globalization (Barringer and Ireland, 2006) while simultaneously safeguarding the environment.

On the other hand, government policies that penalize environmentally unfriendly firms can also encourage the compliance with environmental quality standards and the promotion of green initiatives. Government policy plays a pivotal role in supporting the growth of green entrepreneurship and the success of GVA.

In conclusion, the article proposes that Green Value Addition (GVA) can be a valuable platform for small and medium-sized businesses founded by green entrepreneurs. GVA requires entrepreneurial traits such as flexibility, risk-taking, innovation, and perseverance to create value-adding green initiatives. The authors highlight the importance of integrating GVA into all aspects of a business, so as to create a green culture that can lead to sustainable competitive advantage.

3. Methodology

This thesis focus on the examination of Wiseair, a company that provides air quality monitoring services. The research employs a mixed-methods approach, namely by gathering primary and secondary data, aiming to thoroughly investigate the company's strategies, operations, and the overall impact of its services. A predominantly qualitative approach has been adopted for this research, providing an analytical interpretation of the acquired information to ensure a comprehensive teaching case.

Primary data was gathered through structured interviews with Wiseair's top manager Andrea Bassi, one of the co-founders and the current Head of Sales at Wiseair. The questions were sent via Telegram on the 13th of June and the answers were collected on the 13th and 14th of June.

The purpose of these interviews was to obtain an in-depth understanding of Wiseair's operations, notably its culture and values, and how the founders manage to communicate it to the team, and the company's practices that encourage environmental sustainability throughout its supply chain.

The design of the interview protocol revolves around garnering information about the company's strategic planning, operations, and the impact they have on air quality monitoring. The questions posed during the interviews were open-ended, allowing for expansive responses guided by the study's research questions.

The application of a semi-structured interview proved to be advantageous for several reasons, especially in the case of asynchronous communication, as in the illustrative case of my interview with Mr. Bassi detailed below, where the questions were emailed to Mr. Bassi and his responses were received later via an audio chat.

Among the pros, this technique allowed for flexibility in time and place for both the interviewer and the interviewee. This was particularly beneficial given Mr. Bassi's role in the company and his busy schedule. Additionally, asynchronous communication allowed Mr. Bassi the necessary time to think and respond to the questions, leading to detailed and thought-out responses that provided many insights and rich data. This methodology also helped to remove any potential pressure or bias that may arise in real-time conversations. Mr. Bassi was able to express himself freely and candidly, thereby enhancing the authenticity of the responses.

However, alongside the advantages, some cons were also associated with this approach. The major one being the lack of immediate follow-up questions based on the responses. In a real-time interview, the interviewer can dig deeper into an answer by asking spontaneous follow-up questions. This opportunity was not available in the asynchronous method used.

With this asynchronous format, there was a possibility of losing certain nuances that are typically present in face-to-face interviews, such as tone, inflection, and non-verbal communication. These elements play a significant role in adding depth and context to the responses. Despite these limitations, the structured and asynchronous interview method used proved to be effective in this context. It gave a detailed understanding of Wiseair’s company culture, internal and external strategies and Wiseair’s future perspective.

In addition to the interview, secondary data was collected from various sources. These include information about Wiseair obtained from its official website, press releases, blog posts, online articles, social media posts, and internal company documents, such as reports, memos, and presentations.

By combining document and data analysis with semi-structured interviews, the research findings formed a strong foundation to grasp Wiseair’s role and contribution in air quality monitoring services.

Type of Source	Objectives
<p>Wiseair</p> <ul style="list-style-type: none"> ● Interview with Andrea Bassi, co-founder and Head of Sales at Wiseair (online interview: 13th and 14th of June 2023) ● Website ● Notion page ● Internal documents and report ● Social media posts ● Blog posts ● Press releases 	<p>To obtain in-depth understanding of Wiseair’s operations, its culture and values, and how the founders manage to communicate it to the team, and the company’s practices that encourage environmental sustainability throughout its supply chain.</p>
<p>Official reports and journals</p>	<p>Gathering data published by researches, public bodies, institutions, international organizations.</p>

Table 2 Data Collection Table (source: own table).

4. Case Study: Wiseair

As urbanization continues to expand globally (Mustaffa et al., 2022), air quality has become a growing concern for public health and the environment (Europe's air quality status 2023, European Environment Agency). As it is estimated by the World Health Organization (2019), 9 out of 10 people breathe air containing high levels of pollutants and 7 million deaths are caused every year by outdoor and indoor air pollution.

As the world becomes increasingly aware of the impact of air quality on public health and climate (European Environment Agency), companies like Wiseair are stepping up to provide solutions with the help of green technologies. Wiseair's mission is to empower municipalities, citizens, and businesses to take action by measuring and understanding air quality.

4.1 History

Wiseair was established in 2019 from the idea of four then engineering students at the Polytechnic University of Milan, class of 1995. In 2018, with the assistance of the School of Entrepreneurship and Innovation of the Fondazione Agnelli, Wiseair received financial and technological support to develop and realize their idea, Arianna. Arianna is a smart pot with an Internet of Things (IoT) sensor designed for use on windowsills, balconies and exteriors. It is equipped with a solar panel and is capable of monitoring the quality of the air in real time. The data is then sent to the app, available for both Android and iOS systems.

Initially, the company launched a crowdfunding campaign in Milan for a citizen-science project distributing smart pots to selected citizens, creating an extended and capillary citizen-science network. This initiative aimed to promote communication with Milan's government, providing them with data on air pollution and utilizing the positive community movement created to assist in decision-making regarding pollution.

In 2020, the company successfully concluded a Pre-Seed investment round of 200,000 euros from Linkem Spa. As a result of this initial round of funding, the company's founders took the opportunity to reflect on the business model and ultimately decided to pivot. Despite the significant role played by the community, it became evident that engaging in a direct dialogue with government authorities was crucial to achieve bigger and tangible results.

Wiseair tailored its existing product Arianna to cater to the specific requirements of local administrations, resulting in the creation of "ido". Launched in late 2020, ido is as an air quality

monitoring platform that analysis the data collected from sensors installed across the territory to support the local administration in their decision-making process.

Wisear made a strategic decision to shift their business model from a B2C (business-to-customer) approach to a B2G (business-to-government) approach, recognizing the potential impact of their air quality management solutions on a larger scale. Wisear decided to put its knowledge, experience, and passion at the service of local administrations in the pursuit of clean air. This change required significant adjustment in terms of strategy and approach.

In 2021, the company underwent substantial transformation, structured through the Techstars acceleration program, and developed into a full-fledged start-up. That same year, Ido was adopted by an increasing number of administrations, generating 100,000 euros in turnover.

Wisear also set up citizen science projects in other Italian cities, such as Milan, Turin and Rome, and initiated collaborations with government agencies, in particular with the Regional Agencies for Air Protection (ARPA), to conduct validation campaigns to test and improve their air quality models.

In December 2021, Wisear closed its seed round of investments for 1 million euros, enabling the company to enlarge its team and validate its business model. In May 2022, the company was selected to take part in the Impact Deal acceleration program and participated in various events, including moderating a session on air quality data-driven solutions at the Greening the Islands observatory meeting.

As of June 2023, approximately 56 municipalities across Italy are using ido to monitor the quality of the air in the territory and to use this data to develop and implement sustainable policies.

4.2 Wisear vision and strategy

“Bring back and maintain clean air in the cities we live in.”

Wisear’s vision is to create a sustainable and healthy future for all by bringing back and maintaining clean air in the cities we live in. The company recognizes the importance of meeting the needs of the present without compromising the ability of future generations to meet their own needs.

“By monitoring air quality in cities and pollutant emissions in companies to enable high-impact solutions through actionable information.”

Wisear’s strategy to achieve its mission is to utilize cutting-edge technologies and data analytics to monitor air quality and pollutant emissions in urban areas. By collecting and analysing

environmental data, Wiseair is able to provide decision-makers with actionable information that can support the development of high-impact solutions to improve air quality and reduce pollution.

For Wiseair to succeed, its data-driven approach to addressing environmental challenges is essential. By monitoring air quality in cities, Wiseair can support evidence-based decision-making and facilitate the adoption of sustainable practices. Wiseair's overall strategy to achieving its mission is based on the use of cutting-edge and green technologies and data analytics to provide actionable information and support the development of high-impact solutions. This strategy demonstrates the company's dedication to advancing sustainability and building a more equitable and healthy future for future generations.

4.3 Wiseair's working method

Wiseair is committed to "making the invisible visible" and improving air quality around the world. To that goal, Wiseair adopts an internationally validated and state-of-the-art approach, following the United Nations GEMS Air protocol.

At each stage of the process, Wiseair and the municipality work together to develop and build the most suitable monitoring design for the specific situation. To achieve this, Wiseair offers a service that includes both physical and digital assets. The full proposed solution consists of three main elements:

- Monitoring and data collection
- Analysis and information
- Policy making and evaluation of results

Monitoring and data collection

Wiseair offers a comprehensive range of high-quality sensors to monitor air quality. They measure the concentration of atmospheric particulate matter, including PM1, PM2.5, PM4, PM10, relative humidity, and temperature.

The sensors have been engineered with a high degree of adaptation to ensure they can function effectively in any environment, regardless of the weather conditions. In addition, the sensors are designed to be highly versatile, this ensures that they can be utilized in a wide range of contexts and habitats, from isolated and remote regions to densely populated urban surroundings.

One of the key advantages of the sensors is the use of solar panels to guarantee power autonomy. This means that they can operate independently and continuously without the need for an external power source, making them ideal in areas with intermittent or limited access to energy. Finally, the sensors are equipped with wireless technologies that allow for quick and flawless data transmission.

Wisear also offers sensors to monitor specific substances, such as H₂S, CO, NO_x, VOC, NH₃, O₃, and many others. Like the sensors, these devices can be connected via NB-IoT or Wi-Fi and are designed with integrated solar power.

This provides a flexible and customizable solution for air quality monitoring, allowing customers to leverage their existing investments while benefiting from Wisear's powerful data analytics and visualization tools.

Wisear sensors have a number of benefits, including rapid installation without the need for wires and cables, zero electrical or battery costs, and the use of advanced laser scattering technology to monitor particulate matter according to international monitoring standards. Additionally, the collaboration with the ARPAs, provides a more comprehensive evaluation of the quality of the air. These features have made Wisear be seen by numerous municipalities, businesses, and individuals, as a valuable and sustainable investment to monitor and improve their air quality.



Figure 4 Installation of a Wisear sensor

Analysis and information

Wisear offers a range of air quality monitoring and management tools, designed to meet the needs of various stakeholders: the dashboard and the mobile application.

The real-time dashboard offers administrators and technicians a live visualization platform with information on the air quality for each sensor in real-time, maps of the air quality, historical statistics, and analysis of temporal data. Additionally, users can also download raw data and reports for further analysis.

The purpose of the mobile application is to educate citizens about environmental issues, inform them about air quality, and alert them when it is clean so they may take preventative action to lessen their exposure to unhealthy air. The app also includes an air quality map and a reporting system for odour nuisances, which can assist local municipalities and administrations in identifying and addressing promptly these concerns.

Moreover, Wisear's APIs facilitate the integration of air quality data into existing platforms, enabling easy data display on platforms such as municipal monitors, websites, and communication channels between municipalities and citizens. The digital platform offers a unified and professional experience for all users, with the flexibility to display data across multiple platforms while integrating seamlessly existing sensors.



Figure 5 Wisear mobile application and dashboard

Policy making and evaluation of results

Wisear's team prepare comprehensive reports that provide an in-depth analysis of the air quality situation. These reports include a thorough examination and analysis of sources of emissions in the area, both within and outside the municipality, and categorize and quantify these sources to provide a clear understanding of their impact. The reports also provide proposals and recommendations for policymaking and an initial assessment of their potential effect on municipal emissions.

Additionally, acknowledging the significance of community involvement in high-impact initiatives, Wisear consistently organizes social events to actively engage citizens and amplify the impact of the administration's efforts.

Wisear applies a process of evaluating the outcomes and analysing the current state of air quality to determine the effectiveness of the interventions conducted in collaboration with the municipalities. This makes it possible to track the progress and to spot any required adjustments keep moving the situation forward.

In conclusion, Wisear offers a comprehensive solution to monitoring and improving air quality, with a focus on accuracy, adaptability, and accessibility. Their state-of-the-art sensors and digital platform allow for real-time data collection and analysis, as well as seamless integration with existing systems. Wisear is a totally green technology firm due to the utilization of solar panels to power the sensors, the function of the sensors, and the service as a whole.

Moreover, the company's commitment to community involvement and policymaking ensures that their efforts have a significant and lasting impact on the environment. By partnering with Wisear, municipalities, businesses, and individuals can make informed decisions and take proactive measures to reduce exposure to poor air quality.

4.4 The next challenge: the B2B market

Wisear is currently expanding its business model to include the B2B (business-to-business) market, offering support to the mobility managers of large companies for the drafting of the Home and Work Displacement Plan (PSCL), which is now mandatory for companies with more than 100 employees per company location.

As a part of the effort to minimize air pollution, the approval of Law No. 77 of 17 July 2020 in Italy, introduced the new figure of the mobility manager, who is now responsible for developing an annual home-work travel plans for the company's employees.

Wisear recognized a chance to broaden its influence and penetrate a new market. In 2022, the startup launched Wisear Workplace Mobility, a brand-new service created especially for businesses looking to manage and optimize sustainable corporate mobility.

This solution plays a crucial role in helping companies meet these obligations as it gives the mobility manager a detailed picture of how the company's employees travel between home and work.

Through a questionnaire, Wisear gathers information about employee habits and examines the demand and mobility profiles of the employees inside the firm.

This data reveals how employees travel, the frequency of their travel, the means of transportation used, and the distances they cover to come to the office. This information makes it possible to determine how each employee affects air quality. By aggregating this data at the company level, Wisear gives the mobility manager an overview of the mobility patterns of the entire workforce.

Furthermore, Wisear analyses employees' predisposition towards more sustainable forms of travel and assesses the potential scenarios. This enables forecasts and insights on what to expect if programs like carpooling, incentives for taking public transit, electric car sharing, and other environmentally friendly mobility options are put into practice.

With this data and analysis, Wisear gives the company the possibility to engage in a data-driven dialogue and set realistic expectations for the impact of different initiatives. This makes it possible for companies to effectively allocate budgets, make informed investment decisions, and implement sustainable mobility initiatives tailored to their specific needs and objectives.

Wisear's role goes beyond data collection and analysis. In fact, as they do when working with the local administration, Wisear provides actionable recommendations based on the obtained information, becoming a valuable partner for the company.

Wisear has already established partnerships with well-known companies in the country, including Lavazza, Italgas, and Toyota. These collaborations demonstrate the growing demand for solutions that address workplace mobility and promote environmentally conscious practices. As one of the founders says, Wisear views the expansion into the business-to-business (B2B) market as a turning point solely from a commercial perspective.¹ Although it might be a big

¹ Interview with a Wisear's founder and manager, 13 June 2023.

step for the company's expansion, it is in line with Wiseair's original goals, thus it is considered as a continuation of the path the company has already taken, building upon the foundation of their previous steps.

He continues by saying that Wiseair holds several advantages when it comes to entering the B2B market as it has already established itself in the sustainability sector and has gained recognition and a strong reputation in the recent years.

However, there are challenges associated with entering and approaching the B2B market. In fact, the service provided has some important differences compared to the one offered to the local administrations. So, these early stages are fundamental for Wiseair to understand how to properly navigate this new market and how to leverage the opportunities that it offers.

While the company interacts with both local administrations and businesses, it should be noted that the primary revenue stream and the majority of the company's resources are linked to the B2G market.

Moreover, Wiseair's activities continue to be limited to providing air quality monitoring and data analysis services in Italy. While the company may expand to other countries in the future, its current focus is on supporting Italian communities and local administrations in the fight against air pollution.

4.5 Wiseair's company culture

Wiseair's core values serve as a guide to achieving the company's goals, while also maintaining a positive and cohesive work environment. They provide a compass, ensuring that actions are aligned with the principles that define the company's culture. By adhering to these values, Wiseair aims to create a balance between business objectives and the company commitment to sustainability. Collaboration, integrity, innovation, customer-centricity, employee empowerment, and sustainability are emphasized, creating an environment where success is measured not only in financial achievements but also in the positive impact on employees, customers, and the broader world.

Wiseair's company culture is built upon a strong foundation of fundamental values that connect abstract concepts, such as motivation and company value, with the tangible organizational system. Drawing from the company's webpages and direct interviews with some of its founders and top-managers, Wiseair's core values are presented and analysed in the next paragraphs. The table below summarize the values that Wiseair has on its Notion page.







 We talk about company value <i>Because company value is the only thing that matters</i>
 We are driven by impact <i>Because it dignifies our time and efforts</i>
 We seek autonomy, mastery and purpose <i>Because we find the motivation inside ourselves and we work with happiness</i>
 We make mistakes and ask for help <i>Because we are coachable and driven to learn</i>
 We communicate openly <i>Because we foster clarity and transparency in favour of individual improvement and honest relationships</i>
 We have diversity as our team's superpower <i>Because personalities and cultures are many and we value them all</i>

Table 2 Wiseair Values. Source: <https://wiseair.notion.site>

We talk about company value.

Wiseair’s founders consider company values as a key component of the organization. As stated on the company’s webpage, “We constantly ask ourselves about the value we create for Wiseair before undertaking tasks, celebrating successes, or reflecting on failures. Our team’s primary goal is to pursue and create company value, while still acknowledging individual accomplishments”.²

We are driven by impact.

At Wiseair, the ambition is to make a positive impact on the world. This is how the organization dignifies the time spent working. The concept of impact revolves around the concrete improvement of people’s lives and the natural ecosystem we all inhabit, year after year. Impact plays a crucial role in project prioritization, stakeholder selection, result celebration, and driving the organization’s vision.

We seek autonomy, mastery and purpose.

At Wiseair, it’s cultivated an environment that nurtures individuals’ intrinsic motivators: autonomy, mastery, and purpose. These elements drive the team’s enthusiasm and job

² See Wiseair’s webpage at: <https://wiseair.notion.site/>, accessed on 10 June 2023.

satisfaction, with a conscious effort to limit the use of extrinsic motivators like rewards or penalties.

We make mistakes and ask for help.

At Wiseair, failure is redefined as the inability to learn from mistakes, not merely making them. Mistakes are openly discussed as opportunities for improvement, promoting a culture of continuous learning. The organization values learning from others, including colleagues, mentors, and respected individuals by seeking help. Wiseair attributes its success to its team's willingness to self-reflect, approach learning humbly, and maintain an unquenchable thirst for growth.

We communicate openly.

At Wiseair, non-transparent or unclear communication, can harm relationships, hinder improvement, and breed isolation. Wiseair prioritize creating a secure environment for all, promoting open and honest communication regardless of experience or seniority. Wiseair also encourages a strong feedback culture that is essential for both personal and professional growth.

We have diversity as our team's superpower.

Wiseair values and respects diverse personalities, personal cultures, and backgrounds. There are continuing initiatives to comprehend and value these differences, offering support for personal growth and fostering respect among team members. The organization purposefully uses diversity strategically, considering it a superpower, and feels that it strengthens the whole team, outweighing any individual moments of weakness or self-doubt.

4.6 The importance of values within the company

The founders of Wiseair view the company's values and culture as an essential mean to accomplish their goals and mission effectively. Therefore, they prioritize assembling a team of individuals that align with these values and are motivated to contribute meaningfully to Wiseair's cause. However, as noted by one of the founders, Andrea Bassi, assessing an individual's genuine passion for sustainability during the hiring process can be challenging.³

³ Interview with Wiseair's co-founder, Andrea Bassi, 14 June 2023.

To overcome this problem, Wiseair decided to take a proactive approach by making a priority to clearly communicate the company's values and vision from the start. By doing so, Wiseair ensures that potential candidates have a comprehensive understanding of the organization's mission and the importance of sustainability in the company.

By clearly articulating the company's values and vision, Wiseair allows candidates to assess their personal alignment with the organization's culture and mission. This approach helps ensure that individuals who join the company are genuinely passionate about sustainability and are motivated to contribute to Wiseair's goals in a meaningful way. Nonetheless, the founders recognize that securing individuals who resonate with the organization's values and mission is crucial for maintaining a motivated and productive team as a whole.

Moreover, at Wiseair, the founders prioritize introducing new employees to the company's core values on their first day.⁴ Recognizing the importance of establishing a strong foundation from the very beginning, one of the founders personally explains the values to the new hire or intern during the initial half-hour of the working day. Through engaging stories and examples, the founder illustrates how the values are integrated into Wiseair's operations and decision-making processes. They delve into each value, emphasizing collaboration, integrity, innovation, customer-centricity, employee empowerment, and sustainability. The founder encourages questions and discussions, fostering an inclusive environment where new employees feel connected and understand how their contributions align with Wiseair's values and mission. This introduction sets the stage for a shared understanding and commitment to upholding the values as employees embark on their journey with Wiseair.

When questioned in the interview about the significance of an individual's commitment to the company's green initiative in relation to career advancement opportunities, Andrea Bassi expressed his belief that one's motivation to contribute to sustainability and make a positive impact on the world is inherently reflected in their work. According to Bassi, this intrinsic motivation is evident in the way an individual approaches their responsibilities and the outcomes they achieve.⁵ At Wiseair, the founders recognize that employees who are genuinely passionate about the company's green initiative tend to demonstrate their dedication through their actions and results. Therefore, Bassi emphasizes that "an individual's commitment to

⁴ Interview with Wiseair's co-founder, Andrea Bassi, 14 June 2023.

⁵ Interview with Wiseair's co-founder, Andrea Bassi, 14 June 2023.

sustainability naturally shines through in their work, ultimately influencing their career progression within the organization”.⁶

4.7 Wiseair’s primary activities

For Wiseair, implementing a green supply chain and logistics is crucial.

Wiseair understands that it has an obligation to reduce its ecological impact in all element of its business operations as an environmentally responsible firm. By embracing sustainable practices, it can significantly decrease its environmental impact and also generate cost savings in the long run.

Wiseair’s reputation as a sustainable and responsible brand is enhanced through a green supply chain and logistics strategy, appealing to environmentally conscious consumers and encouraging brand loyalty. Additionally, adhering to environmental regulations becomes more streamlined, mitigating the risk of penalties and legal issues in the future and it can ensure supply chain resilience, reducing vulnerability to environmental disruptions and resource scarcity.

In summary, Wiseair can demonstrate environmental responsibility, cut costs, improve its reputation, adhere to regulations, ensure supply chain resilience, and stimulate innovation and collaboration for a sustainable future by implementing a green supply chain and logistics plan.

4.7.1 Wiseair’s partners

For Wiseair, having reliable partners is essential since it gives them access to a variety of knowledge, cutting-edge technology, and valuable resources. The right partnerships enable Wiseair to enhance its air monitoring solutions, stay at the forefront of innovation, and effectively address the complex challenges of today’s business.

As an environmentally conscious startup, Wiseair’s founders recognize the benefits of forming partnerships with organizations that share their values and demonstrate a dedication to eco-friendly practices, while considering the cost and efficiency of the business. The importance of striking a balance between sustainability and financial viability when selecting partners, it has proven to be a challenge at times. However, by choosing environmentally conscious

⁶ Ibid.

partners, Wiseair can align its efforts, leverage synergies, and collectively contribute to a greener future while fostering mutual growth and success.⁷

4.7.1.2 Sensirion: Wiseair’s sensor’s provider

Wiseair has established a partnership with Sensirion, a sensor provider that not only meets their technological needs but also aligns with their values and commitment to sustainability. This collaboration with Sensirion is regarded as highly beneficial for Wiseair due to the shared focus on sustainable practices and shared values.

Founded in 1998 in Switzerland, Sensirion is a renowned global manufacturer of environmental and flow sensors with a global workforce of over 700 professionals across the world. Sensirion has a large selection of sensor products that allow accurate monitoring and measurement of a variety of environmental characteristics, such as humidity, temperature, gas flow, and liquid flow. For these features, its sensors are widely used in many different industries, including medical, industrial, automotive, analytical instruments, consumer goods, and HVAC products. As stated on its company profile “Sensirion stands for innovation, high-tech and top performance. By constantly trying out new things, advancing into new areas and being one step ahead of the times, we are continuously driving the sensor industry forward with new standards.”

The company has achieved remarkable progress in the field of sensor technology. Its products stand apart from the competition thanks to the use of their patented CMOSens® Technology. This innovative approach allows for intelligent integration of the sensor element, logic, calibration data, and a digital interface onto a single chip, allowing seamless system compatibility and performance optimization.

By integrating Sensirion’s advanced environmental sensors into Wiseair’s air monitoring systems, the partnership aims to enhance the accuracy and effectiveness of air quality monitoring. This collaboration enables Wiseair to deliver cutting-edge solutions to its customers, that provide real-time data that enables them to make informed decisions and get a greater impact on the world.

As before mentioned, the alignment of its partners in terms of values and mission is very important to Wiseair. This is why Wiseair chose Sensirion as its sensor manufacturer.

⁷ Interview with Wiseair’s co-founder, Andrea Bassi, 14 June 2023.

As stated on their official website “We are committed to innovation and smart technology – for a liveable future world. Sensors improve quality of life and reduce energy use and CO₂ emissions across a wide array of applications. With our sensors, we help companies, people and countries to achieve their own CO₂ targets. Detecting air quality requires reliable data. Our sensor technology provides this fundamental basis, enabling the right measures to be taken to improve air indoors and in cities. In our production processes, we continuously set out to reduce water and energy consumption. We give back to society through charitable activities and are committed to compliance with labour standards, to a safe working environment for our employees and to continuous development in environmental issues and ethics.”

Wisear’s mission for a more sustainable future is clearly reflected in the above statement. Sensirion places a strong emphasis on its dedication to innovation and technology, realizing their potential to build a more liveable world. By using Sensirion’s sensors, Wisear seeks to enhance life quality, cut energy use, and lower CO₂ emissions.

As stated in Sensirion’s Sustainability Policy, 2023, the company has in mind very challenging sustainability goals for the near future. The company has set an annual target of reducing electricity and water consumption, as well as greenhouse gas emissions, by 5% relative to added value. Furthermore, all production sites obtain their electricity exclusively from sustainable sources. By the year 2025, the company aims to achieve climate-neutrality in both Scope 1 and Scope 2 emissions, being Scope 1 the direct emissions under a company’s ownership or control and Scope 2 the indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling.

Sensirion’s Sustainability Policy also places a high value on the wellbeing, security, and human rights of its workers. It firmly upholds the principles of dignity and respect in its treatment of its workforce. To ensure the well-being of its employees, Sensirion minimizes the risks associated with health and safety by putting in place necessary safeguards and staying ready for eventual emergencies.

Additionally, Sensirion participates in philanthropic causes to give back to society and show their dedication to social responsibility.

Moreover, the sustainability responsibility is seamlessly integrated into Sensirion’s management system. In fact, all production sites hold certification for environmental protection in accordance with the ISO 14001 standard. Additionally, Sensirion adheres to the ISO 45001 standard to maintain occupational health and safety. Across all its sites, the Responsible Business Alliance Code of Conduct is diligently implemented, further demonstrating Sensirion’s commitment to responsible and ethical business practices.

In conclusion, the partnership between Wiseair and Sensirion is successful because of their common dedication to sustainability. Both companies prioritize environmentally friendly practices, making their partnership an ideal fit. By collaborating, they have successfully transformed the supply chain of Wiseair, aligning it with the company's green vision. This partnership reinforces their joint efforts to create a greener future and promote sustainable practices throughout their operations.

4.7.2 Wiseair's outbound logistics

From the beginning, Wiseair prioritized delivering sensors to its clients in the most sustainable manner possible. Initially, its business was focused on Milan, where the office and headquarters are located, so the deliveries were to be done in a very limited and close area. For this reason, it was possible for the founders to opt for delivering the sensors personally by foot or bike. Once the demand in the Milan area increased, they decided to partner with an external company that used bikes or e-bikes, keeping the delivery process very sustainable.

As Wiseair's delivery area expanded beyond the Milanese borders and they began receiving orders from outside the city, the bike/foot transportation method became impractical. However, they remained committed to maintaining an environmentally friendly approach. They made a conscious decision to avoid using air transportation for all deliveries, even when delivering to southern parts of Italy, where planes would be more a more economically convenient option. They recognized that air transportation had a significant negative environmental impact and as of now they avoid using it.

Andrea Bassi emphasized during the interview that Wiseair always aimed to assess the company's overall carbon footprint. Currently, he says, for the footprint of the outbound transportation, this estimation is relatively straightforward and shows that their environmental benefit outweighs their impact. According to him, this is because when customers and activities are in close proximity, the calculations consistently favour sustainability. He adds that the real challenges arise when expanding into geographically distant markets. In such cases, every interaction incurs environmental costs, such as carbon emissions and other pollutants. Wiseair acknowledges the need to navigate these challenges correctly, ensuring both economic and environmental sustainability. As Andrea Bassi explains, if their services have a positive

environmental impact of 10 but results in a negative impact of 15 to implement it, it is better to refrain from taking action altogether, as it would go against their mission and values.⁸

At this stage, Wiseair has not yet considered how to organize its activities when conducting business with countries far away from Italy. As a result, they have not looked into the possible solutions that best strike a balance between environmental sustainability and cost efficiency. However, the founder affirms that they will happily embrace this challenge when the time is right.

4.7.3 Wiseair's sustainable packaging strategy

Wiseair places a lot of emphasis on its packaging strategy, in an effort to minimize the plastic content. While Wiseair's packaging approach focuses on sustainability, it occasionally leads to some sensors arriving cracked. However, this is a deliberate trade-off made to reduce plastic usage and mitigate breakage during transportation.

Unlike conventional packaging materials such as polystyrene, which is bulky and inefficient in terms of volume, Wiseair chooses layers of bubble wrap. By making this decision, they can get the best results with the least amount of work. The use of bubble wrap strikes a balance between guaranteeing sensor integrity and reducing the environmental impact by adding an extra layer of protection during transit.

The decision to prioritize appropriate packaging reflects Wiseair's commitment to avoiding the negative consequences of delivering unprotected sensors. Without adequate packing, a considerable percentage of sensors would probably fail, costing the company money and having an adverse effect on the environment.

It is important to note that each sensor contains a battery and a photovoltaic panel, which are integral to its functionality. If they were damaged during transportation, the sensor would need to be either discarded or sent back into the supply chain for repairs. Both scenarios have a large impact on each sensor's overall environmental footprint, highlighting the significance of clever packaging solutions.

Wiseair's packaging strategy is therefore a deliberate decision to favour sustainability and reduce environmental effect, even though it occasionally results in cracked/broken sensors. By carefully balancing the need for protection with the goal of reducing plastic usage, Wiseair aims

⁸ Interview with Wiseair's co-founder, Andrea Bassi, 14 June 2023.

to minimize breakages, economic losses, and the ecological consequences associated with inefficient packaging practices.

4.7.4 Wiseair's marketing and sales

The mission of Wiseair is intrinsically linked to universal participation and collective commitment in addressing the challenge of improving air quality. As stated by Andrea Bassi, Wiseair aims to spreading its mission to encompass everyone; "It is crucial to understand that the impact of improving air quality in one city will be limited if neighbouring cities do not share the same dedication, as the polluted air from surrounding areas can contaminate even the greenest of cities."⁹ Therefore, in order to effectively address air pollution and create sustainable living conditions, extensive participation and commitment from all towns and communities are necessary.

4.7.4.1 Wiseair's presence on the media

To achieve this goal, it is essential to establish a build a strong online presence through a variety of social media platforms and actively participate in relevant events.

Wiseair understands the importance and the power of using various digital platforms to increase its reach and communicate with more people. To achieve this, the company is present in different social media platforms such as Instagram, Facebook, and LinkedIn. These platforms provide opportunities to connect with individuals, communities, and organizations interested in sustainability, air quality, and related topics.

On Instagram, Wiseair shares different types of content: a video of the company shows the working life, the initiatives and events that Wiseair takes part in and also educational posts to inform the users about climate change and pollution. Facebook and LinkedIn have a similar content, as Wiseair shares relevant updates, articles, and insights related to air quality, sustainability, and the company's ongoing and future projects.

Additionally, Wiseair recognizes the importance of traditional media channels such as newspapers. It actively works to secure coverage and articles that highlight the company's history, core principles, current initiatives, and long-term goals. By leveraging the reach of

⁹ Interview with Wiseair's co-founder, Andrea Bassi, 14 June 2023.

newspapers, Wiseair can reach a broader audience and generate awareness about the importance of air quality and Wiseair's contributions in the field.

Through its presence in the media, Wiseair makes sure that its message reaches a diverse range of individuals, from concerned citizens to policymakers and industry professionals. This multi-channel approach allows Wiseair to educate and inform a wide audience, build brand awareness, and position itself as an industry leader in sustainable development and air quality monitoring.



Figure 6 Wiseair post on the company LinkedIn

4.7.4.2 Empowering local communities through events and environmental awareness

In order to maximize its outreach and raise awareness in the community, Wiseair actively participates in local events on the Italian territory. These events serve as platforms to discuss about sustainability, green economy, clean air, etc. By participating in these events, Wiseair hopes to raise awareness of its services and emphasize the positive effects it could have in the area.

Also, these events organized by and for local administration, can be seen as a network event. They make it possible for Wiseair to contact with and develop relationships with local authorities, people, and community leaders. By working together, Wiseair is better able to match its goals and objectives with the needs of the communities it serves and attract new customers.

Additionally, these occasions offer Wiseair a chance to gain a deeper understanding of its customers and their needs. Wiseair can gather valuable feedback and insights, by listening to the speeches and by talking with the participants throughout the event. This feedback is essential for improving its offerings, comprehending the unique needs of each town, and modifying its strategy to better meet local residents' wants.

Wiseair's recent participation in the *Assemblea Rete dei Comuni Sostenibili 2023* (Assembly of the Network of Sustainable Municipalities) in early March is one notable example of the company's proactive engagement.

The Network of Sustainable Municipalities is an association established in 2021 to support municipalities in achieving the UN's 2030 Agenda for sustainable development. Over the past two years of work, more than 80 municipalities from across Italy have joined the network, representing diverse populations and political affiliations. In an interview for the article post on GSA *Igiene Urban* on February 28, the Network's president, Valerio Lucciarini De Vincenzi, stated that effective achievement of sustainability goals requires the active involvement and leadership of municipalities, mayors, and local administrators.

This is in line with Wiseair's vision and mission, and this is why Wiseair was one of the two sponsors of the event. In this event Elisa Leone Saliconi, the Brand & Communication specialist of Wiseair presented Wiseair and gave a talk intitled "The voluntary monitoring of the municipalities: the experimentation, the results, the objectives of the Network of Sustainable Municipalities."

This event was a significant platform for Wiseair, because it created an opportunity for the team to talk with various stakeholders about innovative projects and/or to talk and initiate a debate around the topic of air quality.

By attending this assembly, Wiseair had the opportunity to engage with municipalities that prioritize sustainability to show to the administrations that Wiseair is a company that shares the same goals and values and to gather feedback to address effectively the specific requirements of each municipality.

Another example of Wiseair's commitment to showcase its work and the results is the case of San Vito al Tagliamento, the first sustainable municipality in the Friuli Venezia Giulia region. The municipality was presented with a plaque on the occasion of the delivery of the first report on air quality produced by Wiseair, in an event organized by the municipality and open to the entire community and neighbouring municipality.

In this occasion, the city councillor Federica Del Frè and the mayor Alberto Bernava shared their view on their collaboration with Wiseair on an article published on the website Rete dei Comuni Sostenibili: "Wiseair's services enable the collection and dissemination of air quality data in a manner that is easily accessible and understandable for citizens. The event of March 25 brought together the Network of Sustainable Municipalities and Wiseair in the presentation to the entire San Vito community and neighbouring municipalities of these virtuous monitoring practices, the first step towards an awareness that then allows everyone, [...], to take safer and more conscious steps towards a truly sustainable development for current and future generations."

The delivery of the plaque and the presentation of the air quality report serve as significant milestones in the ongoing efforts of San Vito al Tagliamento and Wiseair in their pursuit of sustainable practices and improved air quality. By collaborating and sharing valuable insights, they aim to inspire and encourage other municipalities to undertake similar initiatives for the benefit of their communities and the environment.

Wiseair also understands the importance of promoting sustainability in schools and promoting awareness among students and younger generations. The founders are of the idea that engaging with schools allows Wiseair to create a ripple effect by inspiring students to become advocates for clean air and sustainable practices. By instilling a sense of responsibility and encouraging environmentally conscious behaviour from an early age, Wiseair aims to nurture a future generation that is proactive in creating positive change.

For this reason, Wiseair has collaborations with schools, that consist in providing access to its monitoring data to the students and teaching them how to analyse and understand them.

With this hands-on experience students can better understand the effects of air pollution in the real world, with the hope that this empowers them to make informed choices and promote change.

One example of Wiseair's commitment is the project that was launched in early 2022 in collaboration with the Istituto Comprensivo Cesare Battisti. This collaboration was possible due to the Wiseair's sensors that were installed in the Cogliate and Ceriano schools, that allowed

instructors and children to have access to real-time air quality monitoring of their area. Students used the app and the dashboard to gather the data and the information that were then used in the classroom activities and discussion.

With these projects, Wiseair aims to make scientific topics more accessible and funnier for students and to raise awareness about air pollution and its impact and to inspire the younger generation to take an active role in environmental monitoring.

4.8 Wiseair's future steps

Wiseair's next steps involve a strong focus on advancing their technology. The founders place a high priority on this component of their mission and concurred that now is the ideal time to make investments to advance the company's technology.

This decision was made with the intention of improving Wiseair's service in terms of performance and pricing with the consequent result of increasing Wiseair's environmental impact.

For this reason, there will be a significant investment, both human and non-human capital, dedicated in technological development. This decision shows, once again, the dedication and commitment of Wiseair to drive innovation and improve its offerings, in hope to give a superior service in line with their objective of supplying high-performance solutions by investing in cutting-edge technologies.

Moreover, the emphasis on affordability suggests Wiseair's desire to open up its services to a wider range of customers. This strategic approach ensures that their vision of environmental impact is not limited to a select few but extends to a broader audience, amplifying their influence on sustainable practices.

In conclusion, Wiseair's future steps will focus on improving its technology in order to make its service more affordable and effective and increase its impact.

5. Italian “State of the Art”

5.1 Europe’s air quality status and laws

Europe’s air quality status in 2023 remains a significant concern as air pollution continues to pose a major health risk (Europe’s air quality status 2023, 2023). Despite ongoing improvements, air pollution levels across Europe still exceed EU standards. The World Health Organization’s health-based guideline levels are also consistently surpassed. As documented in the report, nearly the entire urban population in Europe (97%) was exposed in 2021 to concentrations of fine particulate matter (PM_{2.5}) well above the WHO guideline level.

Central-eastern Europe and Italy reported the highest concentrations of particulate matter, largely due to the burning of solid fuels for heating and industrial purposes. All European countries reported levels of ozone and nitrogen dioxide above the WHO guideline levels. The Mediterranean region and central Europe recorded the highest levels of ozone.

Exceedances of air quality standards are widespread throughout the EU, indicating the need for further action.

The European Commission has set ambitious goals. On 26 October 2022, as part of the European Green Deal, the Commission proposed to revise the Ambient Air Quality Directives. The revision aligns the air quality standards more closely with the recommendations of the World Health Organization (updated in 2021). Table 1, below, indicates the EU limits for the main airborne pollutant.

Pollutant	Averaging Period	Limit Value	Comments
PM ₁₀	daily mean	50 µg/m ³	Not to be exceeded on more than 35 days per year
	yearly mean	40 µg/m ³	
PM _{2,5}	yearly mean	25 µg/m ³	Maximum exposure concentration 20 µg/m ³
O ₃	max daily 8 hour mean	120 µg/m ³	Not to be exceeded on more than 25 days per year
NO ₂	hourly mean	200 µg/m ³	Not to be exceeded on more than 18 times per year
	daily mean	40 µg/m ³	
SO ₂	hourly mean	355 µg/m ³	Not to be exceeded on more than 24 times per year (hourly) and 3 times per year (daily)
	daily mean	125 µg/m ³	
CO	max daily 8 hour mean	10 µg/m ³	

Table 4 Air quality standards given in the EU Ambient Air Quality Directives (European Commission).

5.2 Italy air quality status

Being part of the EU, Italy has to respect the limit values that have been established by the Union.

As stated by “Sistema nazionale per la protezione dell’ambiente”, in 2022 the annual limit values of PM₁₀ (40 µg/m³) and PM_{2.5} (25 µg/m³) were respected throughout the Italian national territory (respectively in 99.6% and 98.7% of the measurement points), with very few localized exceptions: the Po Valley, the agglomerations of Rome and Naples-Caserta, the Valle del Sacco area, the Piana Lucchese area and the Venafrana plain, in the province of Brindisi and in the Industrial Areas area in Sicily. The limit value of nitrogen dioxide is also respected in the vast majority of monitoring stations (97.5%), although it is to be recorded that it is exceeded in a limited number of stations, located in large urban areas near major road arteries: Turin, Milan, Bergamo, Genoa, Florence, Rome, Naples, Catania and Palermo. However, the hourly limit value is respected everywhere.

The ozone concentration levels, however, continue not to meet the targets set by law in a large part of the country (only 11.3% of the stations meet the long-term target, equal to 120 µg/m³ as the highest value of the average mobile daily eight hours). This level not in line with the parameters set by the law is due to the summer weather conditions: extreme heat and absence of rainfall that characterized the summer of 2022.

Italy’s major urban areas are struggling to meet the EU limits for the primary airborne pollutant, posing a significant risk to its citizens due to deteriorating air quality.

A study published by “Legambiente” (2022), an Italian environmental organization, has revealed that Italian citizens are continuously exposed to air pollution levels that significantly exceed established limits, posing severe health risks. Italy ranks among the countries with the highest levels of air pollution in Europe, with a substantial number of premature deaths attributed to fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂). According to data from the European Environment Agency in 2022, Italy recorded 59,500 deaths attributable to PM_{2.5} and 21,600 deaths attributable to NO₂, placing it at the top of the EU ranking.

The revision of Europe’s Ambient Air Quality Directive, which is projected to be implemented by 2030, sets stricter standards for air quality. However, according to Legambiente, if these standards were applied today, 76% of Italian cities would exceed the PM₁₀ ceiling, 84% the PM_{2.5} ceiling, and 61% the NO₂ ceiling. It is clear that Italian cities face significant challenges in complying with these future restrictions within the next seven years. Additionally, the trends

in pollution reduction observed thus far are discouraging, with an average annual rate of PM₁₀ reduction at 2% and NO₂ reduction at 3%.

The report emphasizes that Italian cities must diligently work to meet the new air quality standards, in light of the fact that the World Health Organization (WHO) guidelines, which are even more stringent than the future European limits, should be the ultimate objective for protecting public health. Legambiente makes a number of recommendations and suggestions for local and national authorities, such as creating of zero-emission areas in cities, providing incentives for energy-efficient building renovations, and enhancing public transport and shared mobility options.

As previously said, air pollution has direct consequences for human health, contributing to the development of serious medical conditions such as asthma, respiratory infections, heart disease, strokes, bronchitis, and cancer. Additionally, it negatively affects Europe's natural environment, biodiversity, agricultural products, natural vegetation, and historical structures, by causing acidification, eutrophication, and damage to monuments.

It is impossible to stress the urgent need for comprehensive and effective policies that address multiple sources of pollution, from transportation to heating systems, industry, and agriculture. To protect the health and wellbeing of Italians and minimize the negative impacts of air pollution on the environment, it is required immediate action.

5.3 The view on climate change of the Italian population

The 2022-2023 European Investment Bank (EIB) Climate Survey reveals a striking shift in the attitudes of young Italians towards climate change and their individual actions to combat it.

Notably, 81% of Italians in their 20s consider the climate impact of prospective employers to be an essential factor when job hunting, with 25% ranking it as their top priority. This growing trend reflects a strong emphasis on sustainability and environmental responsibility in career choices among the youth. Furthermore, a significant 85% of Italian respondents advocate for the labelling of all food products to display their climate footprint, allowing consumers to make more informed and sustainable choices while grocery shopping. This action aims to reduce the significant greenhouse gas emissions linked to food production.

The survey also shows that young Italians are prepared to support their opinions with real and concrete action. About 64% of them are willing to pay a premium for climate-friendly food, demonstrating their commitment to supporting environmentally conscious practices in the food

The overall image painted by the EIB Climate Survey is one of a society that is becoming increasingly conscious about climate change and eager to adopt more sustainable practices at both individual and policy levels. The strong emphasis on climate-friendly behaviour and support for government intervention signals a transformative shift towards a more environmentally conscious and sustainable future in Italy.

5.4 The governmental response: Regional Agencies for the Protection of the Environment (ARPA)

The Italian environmental protection system, known as the “Sistema Nazionale per la Protezione Ambientale” (SNPA), operates under the guidance of the European Union’s environmental framework. Comprising the “Istituto Superiore per la Protezione e la Ricerca Ambientale” (ISPRA) and the regional “Agenzie Regionali Protezione Ambiente” (ARPAs), SNPA’s responsibilities span from monitoring and safeguarding environmental quality to providing scientific research and support to decision-makers.

The primary responsibilities of SNPA include conducting inspections and environmental controls, keeping an eye on the condition of the national environment, and managing pollutant emissions and water sources. It disseminates official environmental statistics, reports, and statistical analyses as well as providing technical-scientific support to various governmental agencies engaged in environmental issues.

Through its environmental informative system, “Sistema Informativo Nazionale Ambientale” (SINA), SNPA collects and provides data on the Italian environmental situation at both local and national levels. It also offers binding opinions on environmental policies, advocating for sustainable development objectives, land conservation, and the safeguarding of natural resources.

As part of the European Environment Information and Observation Network (EIONet), SNPA collaborates with other EU member countries, Iceland, Norway, and Balkans countries. EIONet, managed by the European Environmental Agency (EEA), seeks to harmonize and coordinate national informative systems. SNPA, acting as the National Reference Centre (NRC) for Italy, plays a crucial role in this partnership by contributing to data collection and mutual cooperation with other member institutions.

Overall, SNPA plays a pivotal role in the Italian's environmental protection efforts, because it supports the country in aligning them with EU standards and by doing so it contributes to the greater goal of promoting environmental sustainability and protection on an international scale.

6. Italian investments in the green and tech world

Italy is committed to adhering to European laws aimed at combating climate change. As part of this effort, the country has developed a comprehensive plan to invest in the green revolution, green technology, and support startups in the sustainable sector. By prioritizing these initiatives, Italy aims to foster innovation and contribute to a more environmentally friendly and sustainable future in line with the EU's climate objectives.

6.1 Italy's recovery and resilience plan

As stated in its National recovery and resilience plan dossier, Italy has faced a more severe impact from the Covid-19 pandemic compared to other European countries. In 2020, its gross domestic product (GDP) experienced a significant decline of 8.9%, surpassing the European Union's average decrease of 6.2%. The country was the first to be hit by the health crisis, and the first EU nation to enforce a widespread lockdown. The pandemic's toll has been particularly devastating on Italy, both economically and in terms of human suffering.

The EU response was to craft a recovery and resilience plan with the primary objective of stimulating the recovery and prepare Italy for the future. The goal of the strategy is to promote sustainability, resilience, and adaptation in the face of the opportunities and difficulties presented by the green and digital transitions.

The National Recovery and Resilience Plan delineates the goals, reforms, and investments that Italy aims to undertake using NextGenerationEU funds. Its primary purpose is to alleviate the socio-economic impact of COVID-19 while promoting a fairer, greener, and more inclusive nation. The plan intends to increase Italy's competitiveness, dynamism, and innovation in its economy. The strategy is structured around six Missions, each of which focuses on specific thematic areas of intervention.

As stated on the official website of the European Commission, the comprehensive plan comprises 132 strategic investments and 58 essential reforms. To ensure its successful execution, the plan will receive financial support of €68.9 billion in grants and €122.6 billion in loans. Notably, 37.5% of these funds will be dedicated to advancing climate objectives, while 25.1% will be directed towards facilitating the digital transition.

The key to the plan's transformative impact lies in the ambitious and synergistic nature of its reforms and investments. These measures have been specifically designed to address the

particular challenges faced by Italy. By addressing obstacles to sustainable growth and targeting investments in digital and green initiatives, the plan aims to bridge social and territorial divides. Given the urgency of the situation, all reforms and investments are slated to be implemented within a tight timeframe. The Regulation on the Recovery and Resilience Facility requires that they are completed by August 2026. This sense of urgency highlights the commitment to ensuring a speedy and successful recovery, putting Italy on the road to a more sustainable and promising future.

6.2 The Italian green tech startup environment

The greentech startup scene in Italy is incredibly vibrant and shows great promise for the future. As stated in the article of Startup-News, May 2023, Italian green-tech startups are experiencing remarkable growth. Although green techs currently represent only 3% of the total startups in the country, this segment has seen a substantial 42-percentage-point increase compared to 2021. The B-PlanNow research indicates that there are approximately 370 green startups currently operating in Italy. These startups are primarily active in sectors such as *agritech & food* (20%), energy (19%), industry (15%), sustainable mobility (12%), and recycling (11%). Moreover, the real estate and climate monitoring sectors are present but with relatively fewer startups. Looking at the regional distribution, Lombardy (around 22%), Lazio (12%), and Piedmont (11%) emerge as the regions with the highest concentration of greentech startups. Among cities, Milan leads in terms of startup density, followed by Rome and Turin.

The growth and potential of the Italian green startups was also underlined by Nicola Zanetti, CEO and founder of B-PlanNow that commented on the latest State of Climate Tech Report by PricewaterhouseCoopers saying that the data shows that the growth of capital invested in green startups globally exceeded 200% between 2020 and 2021, reaching the 87 billion dollars and while, in Italy those number have not been reached yet, there is hope for the future as Italy has “a young ecosystem with great possibilities.”

As stated on Rinnovabili.it (2023), the majority of investments in Italian greentech startups come from domestic sources, accounting for 87% of the total. This indicates that foreign capital has a relatively limited impact on the Italian greentech sector. Additionally, the per capita investment in Italy is relatively low compared to other countries. Italy’s per capita share is stated as only 3.5 euros, placing it second-to-last, behind Greece. In contrast, Germany and France are reported to have invested 30 euros and 40 euros per capita, respectively, in 2022.

6.3 Wiseair's partnership with ARPA Sicily

In the fight against air pollution and advance environmental research, Wiseair and ARPA Sicily have created a ground-breaking collaboration, revolutionizing air quality monitoring in Italy. Local air quality monitoring has become an essential tool for supporting governmental bodies in promoting sustainable urban development policies and providing citizens with access to clear and transparent information about the air quality they breathe. In line with this objective, the United Nations' GEMS Air program aims to enhance the accessibility and widespread availability of air monitoring by integrating traditional fixed monitoring stations with new, cost-effective pollutant monitoring technologies that have emerged from research in recent years. Based on this approach, a collaboration between Wiseair and the Sicilian ARPA was initiated. This partnership consisted in utilizing the information collected by Wiseair and ARPA, to primarily to assess the quality of the data produced by Wiseair.

ARPA Sicily has decided to carry on the analysis of these new technologies by installing 3 Wiseair sensors near the monitoring stations installed in the city of Catania. The collaborative effort's main goal is to conduct a comprehensive comparative analysis between the data gathered by the Wiseair systems and ARPA's fixed monitoring stations. The key objective is to assess the quality of the data and consider the possibility of collaboratively constructing corrective models to increase its accuracy.

Through this collaboration, Italy, with a particular focus on the Sicilian region, emerges as a pioneering entity in leveraging advanced technologies for environmental monitoring. This endeavour is of significant importance for facilitating the forthcoming green transition, which is necessary for future progress.

Vincenzo Infantino, the general manager of Arpa Sicilia, emphasizes the importance of innovation, experimentation, and belief in research in an article published in June 2021 on the ARPA Sicilia webpage. In the article he adds "The collaboration with the young Italian start-up Wiseair is part of this ambitious path that Arpa Sicilia has decided to dedicate to research and innovation. We are convinced that promoting pioneering processes, involving young entrepreneurs and stakeholders, means projecting Arpa Sicilia towards internationally competitive objectives and, therefore, encouraging that technological transfer between the scientific world and companies which is so important for promoting research results."

In the same article Paolo Barbato, the co-founder and CEO of Wiseair shares his thoughts on the importance of this collaboration. "Wiseair was born with a mission to promote and defend clean air in our cities. We have always known that collaboration with institutional bodies would

be a key point in achieving our goal. Dozens of municipalities across Italy are using our platform to support their green transition. The collaboration with Arpa Sicilia will allow us to promote the use of our technologies also within regional agencies, with an ever-greater impact [...].”

7. Teaching Notes

7.1 Case overview

This dissertation delves into the case study of Wiseair, a green tech startup that specializes in offering sensors to measure and monitor air quality and a service to analyse data, producing detailed reports that make it easier to take actions to improve air quality. At the moment, Wiseair mainly caters to municipal governments.

Apart from exploring existing literature on green tech startups and identifying key success factors, the dissertation examines how Wiseair has implemented and has been influenced by these external and internal factors. The primary objective of this study is to analyse the key success factors for green tech startups and is focused on Wiseair as a green tech startup that effectively balances economic goals with sustainable practices, ultimately achieving success.

To provide actionable recommendations for Wiseair, students will draw upon the theoretical frameworks presented in the Literature Review. By analysing Wiseair's experiences and outcomes through the lens of these theoretical constructs, the dissertation aims to offer feasible and innovative suggestions that can further enhance Wiseair's performance as a sustainable and prosperous green tech startup.

7.2 Target group

The researcher suggests using this case study as a teaching tool to promote engaging class discussions in Undergraduate- or Master-level courses. This case study includes a wide range of topics, such as startups, sustainability, company culture, strategies, operations, and the influence of the outside world on advancing a green tech startup.

The case study holds potential for integration into courses like Social Entrepreneurship, Strategic Management, Business Ethics, and other subjects that focus on strategy or company culture. By exploring the various dimensions of Wiseair's journey, students can gain valuable insights into the complexities and challenges faced by green tech startups striving to achieve a harmonious blend of economic success and sustainable practices.

7.3 Learning objectives

Through the discussion of Wiseair case study, students will have the chance to demonstrate how an established green tech startup can successfully balance its environmental missions and

its financial goals. This practical examination attempts to bridge the gap between theoretical concepts and practical application.

Students can learn a lot from Wiseair's story about the entrepreneurial path leading to the establishment and sustainability of a green tech startup. The case study intends to demonstrate concretely how Wiseair proactively engages in sustainable practices while underlining the challenges and problems that such an environmentally conscious and technical startup may experience. The study will also show how Wiseair successfully overcomes these challenges on its road to success.

7.4 Assignment questions

The following questions aim to encourage students to apply the theoretical concepts relevant to the case study. With their analytical skills and managerial knowledge, students are expected to provide answers to the following two assignment questions:

1. How does Wiseair successfully integrate sustainability objectives with economic goals?
2. What challenges might Wiseair encounter in the B2B market, and how can these be overcome? Start by conducting a SWOT analysis for the B2B service.

7.5 Class Discussion

The following teaching discussion is structured for a 90-minute class, covering in detail a methodical process of analysing and answering to the questions above.

7.5.1 Guidelines for the instructor

This section's goal is to outline a lesson plan that the instructor can use to instruct the case and lead the in-class discussion. To ensure active participation from students during the discussion, it is essential that they come prepared. Hence, it is recommended to distribute the case in advance, one week in advance would give the students enough time to read the case study. Also, as part of the preparation, the instructor should assign Nelson Oly Ndubisi et al.'s (2009) as a mandatory reading, so students will come prepared also in relation to the theoretical framework. This reading will provide them with valuable insights and background information that will enrich their understanding of the case.

As students have read in advance the material, the instructor can spend 15 minutes to review the theoretical framework and give a brief overview of the concepts of *startup*, *green technology* and *green tech startup*.

By presenting these core ideas and theoretical frameworks, students will get a thorough understanding of the important terminologies and their meaning in the context of sustainability, green technology, and entrepreneurship.

Following the introduction, the class will be encouraged to share their initial impressions and thoughts about the case. This approach serves as an effective icebreaker, especially in an undergraduate program where students may require more encouragement to actively participate. By expressing their opinions, students will realize that there are no right or wrong answers, promoting a comfortable and open atmosphere for discussion. As a result of feeling more comfortable sharing their opinion, students should be more involved in and interactive in the discussion of the case questions.

Subsequently, students will be organized into groups of five to engage in a 50-minute group-discussion regarding the provided teaching question.

The table underneath depicts a recommendation for a potential schedule designed for a 90-minute-lecture. It shows the activities and intended duration of each assigned task.

Activity	Conducted by	Content	Time (min)
Introduction	Instructor	Recap of the theoretical framework	10
		Recap of the case study and ice breaker	5
Teaching question 1	Group of 5 students each	Trade-off: economic and sustainable goals Primary and internal support activities	25
Teaching question 2		SWOT analysis Challenges and possible solutions	25
In-class discussion	Class	Discussing answers to teaching questions	20
Conclusion	Instructor	Key takeaways	5

Table 5 Board Plan (source: own illustration)

7.5.2 Assignment question one

How does Wisesir successfully integrate sustainability objectives with economic goals?

For the initial task, the instructor should recommend that students allocate 25 minutes to it. Students are guided to look into the theoretical framework and the Wiseair-related section, particularly chapters 3.4 *Wiseair's company culture*, 3.5 *The importance of values within the company*, and 3.6 *Wiseair's primary activities*. For the literature review part, students should carefully look at 2.3 *Theoretical Framework: Green Entrepreneurship (GE) And Green Value Added (GVA)* and in particular the subchapter *The GVA Process - Primary activities and Internal Support Activities*.

During the review process, students should be capable of applying the theory to the practical context of the Wiseair case study. They should concentrate on analysing the strategies, procedures, and methods Wiseair uses to successfully strike a balance between its sustainability goals and its business viability.

Next, students are encouraged to revisit the literature review and utilize the GVA process, which draws from the value chain model introduced by Porter (1985). This kind of analysis should be used to analyse both the primary and support activities that make up Wiseair's value generating process.

Students should be able to identify the sustainable initiatives that the startup has implemented and understand how these activities support its economic objectives. Alternatively, they should be able to identify the concessions and trade-offs that Wiseair makes in its pursuit of maximal sustainability.

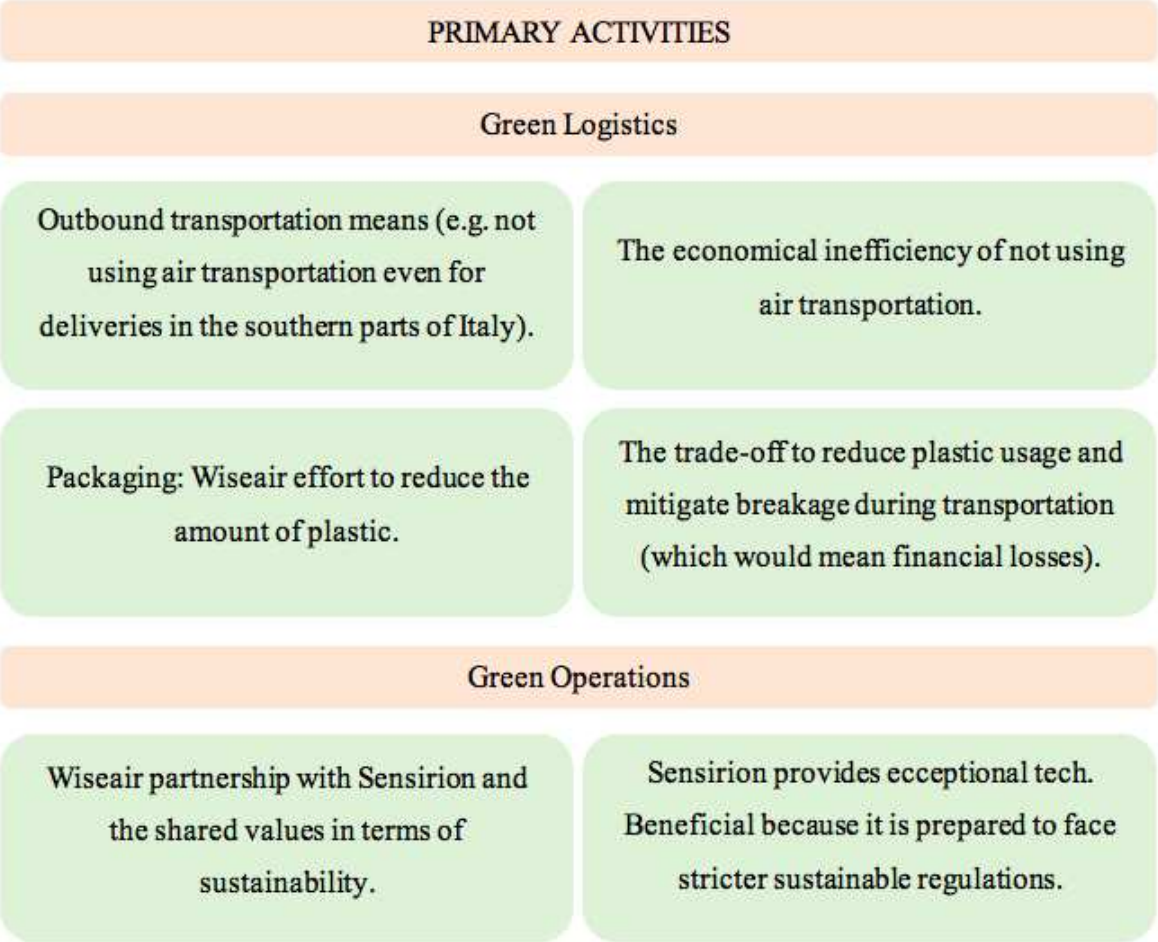
The first thing that students should look at is how Wiseair has incorporated sustainability into their core beliefs and guiding principles. Students should investigate how this commitment forms the basis for their strategic decisions and guides not just their decision-making procedures but also their human resource management plans and the team's development paths.

In order to complete the task, students should examine the partnerships formed by Wiseair and analyse the contributions they provide in terms of sustainability and financial goals. Students should evaluate Wiseair's collaboration with Sensirion and ARPA Sicily, observing how common ideals and environmentally beneficial practices foster productive alliances. This section provides insight into leveraging synergies, getting access to cutting-edge technology, and working together to create a greener future.

Additionally, students should also investigate the outbound logistics related to transportation and packing. The case guides students to examine Wiseair's transition from foot and bike deliveries to avoiding air transportation, even when it is economically convenient. This section offers an opportunity to discuss the trade-offs between economic gains and environmental benefits. The packaging strategy demonstrates Wiseair's commitment to balancing

sustainability and protection. Students can consider how Wiseair’s packaging choices prioritize reducing plastic usage while maintaining sensor integrity throughout transit. This section prompts discussions on conscious trade-offs and their implications.

Finally, students need to evaluate Wiseair’s activity on social media platforms and its involvement with the community. Students should explore how Wiseair effectively uses social media platforms to spread its mission. This section offers insights into reaching a diverse audience and building brand authority in sustainability. Also, the team’s active participation in local events and community engagement showcases their commitment to wider societal impact. Students should assess how Wiseair works with local governments and educational institutions to promote environmental awareness. Figure 8 summarize how Wisisir successfully integrate sustainability objectives with economic goals.



Green Marketing and Sales

Wiseair effort to spreading its mission and increase the community environmental awareness. The presence on (social) media and in events.

Being presence on the media and in events increases its clientel and the brand recognition and improve brand awareness (also beneficial for the B2B market).

INTERNAL SUPPORT ACTIVITIES

Green Infrastructure Development

The significance of the company's culture and values as fundamental guiding principles.

Wiseair adaptability and flexibility in extending its green mission to diverse markets (from B2C to B2G to B2B).

Green Human Resource Management

The hiring process and the imprinting of the values of the company on the first day of work/internship.

Andrea Bassi belief that one's motivation to contribute to sustainability is inherently reflected in their work.

The economic benefit of having a highly motivated team that have at heart the green mission of the company.

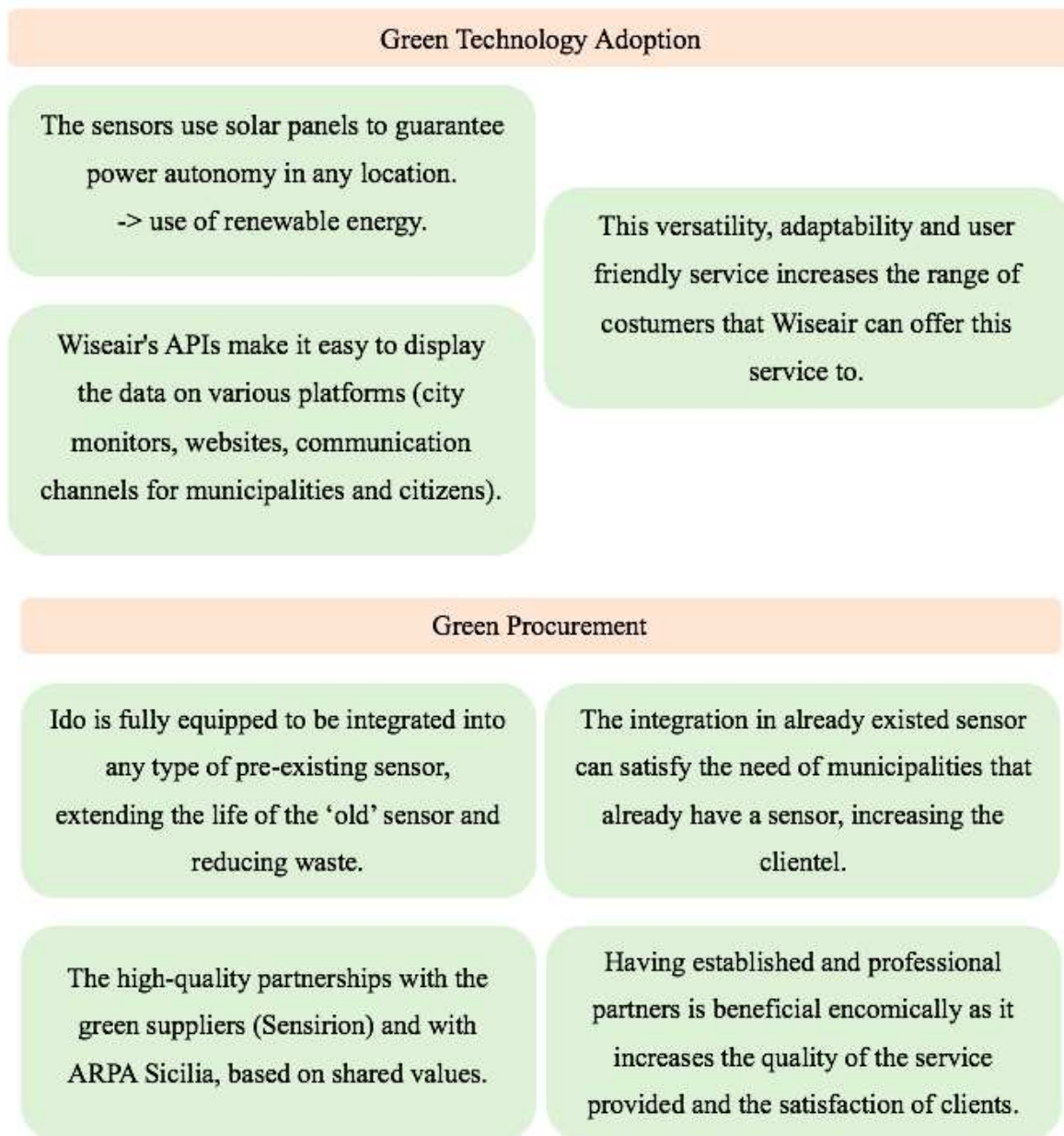


Figure 8 Summary assignment question one (source: own figure)

7.5.4 Assignment question two

What challenges might Wiseair encounter in the B2B market, and how can these be overcome? Start by conducting a SWOT analysis for the B2B service.

For the final assignment, the instructor should dedicate approximately 25 minutes of class discussion. Students are advised to review the chapter titled *The Next Challenge: The B2B Market* from the case study provided. During their revision, they should pay particular attention to understanding and contrasting the key differences between the B2G and B2B markets.

Additionally, students should carefully analyse the distinct services offered by Wiseair to its diverse range of customers.

Looking at the literature review, students should focus on chapter 2.1.4 *SWOT Analysis* and keep in mind chapter 2.3 *Theoretical Framework: Green Entrepreneurship (GE) And Green Value Added (GVA)*.

By focusing on these specific aspects, students will have a greater understanding of the complexities associated with catering to different customer segments and markets. This knowledge will prove essential in formulating effective strategies for Wiseair’s future success. To kickstart the analysis, it is highly recommended to start with a comprehensive SWOT analysis. This will help identify and highlight both the internal factors (strengths and weaknesses) and external factors (opportunities and threats) associated with venturing into the B2B market.

Assessing internal strengths and weaknesses will shed light on areas where Wiseair excels and areas that need improvement, highlighting the possible internal challenges. Simultaneously, evaluating external opportunities and threats will help the company gauge the market landscape and anticipate challenges or potential growth avenues.

Thus, the SWOT analysis serves as a solid foundation for making informed and well-calibrated decisions in pursuit of success in the B2B market.

The following SWOT table includes the strengths, weaknesses, opportunities and threats that the students have to include in their response.

Strengths	Weaknesses
1 Strong reputation. Having gained trust and a strong reputation in Italy, Wiseair possesses a valuable asset as it enters the B2B market.	1 Limited B2B experience, which could lead to challenges in understanding the unique dynamics of this sector.
2 Skilled Workforce. With a skilled workforce, Wiseair delivers high-quality solutions effectively also in B2B.	2 Resource Constraint. Wiseair may face resource constraints, both in terms of capital and human resources.
3 Technological Expertise can be transferred to provide advanced solutions to B2B clients.	3 Scaling challenges. Meeting B2B demand requires Wiseair to adapt production and logistics to match corporate delivery needs, posing operational challenges.
4 Network and Partnerships. Existing partnerships like Sensirion showcase Wiseair’s collaboration prowess, enabling access to B2B clients and valuable resources.	4 Customer relationship management. B2B dynamics necessitate personalized and lasting

	commitment, urging Wiseair to bolster customer relationship strategies.
<p>Opportunity</p> <p>1 Growing B2B demand for Sustainability offers Wiseair a chance as eco-friendly solutions align with corporate social responsibility aims.</p> <p>2 Regulatory support Supportive government policies foster Wiseair’s B2B expansion by promoting sustainable practices.</p> <p>3 Partnership and collaboration Strategic alliances with B2B firms or sustainability-focused organizations can extend Wiseair’s reach and clientele.</p> <p>4 Expansion into new markets. Wiseair can tap into the B2B market, serving multinational companies to expand into new geographical territories and gain valuable international insights.</p>	<p>Threats</p> <p>1 Competition In a competitive B2B landscape, Wiseair must distinguish itself and highlight its unique value against rivals.</p> <p>2 Economic factors Economic fluctuations can influence sustainability investments, impacting demand for Wiseair’s offerings.</p> <p>3 Changing of regulation Compliance with evolving sustainability regulations may require ongoing adjustments to Wiseair’s products and operations.</p> <p>4 Market entry barriers Entering the B2B market may require adapting products to meet specific industry standards and gaining the trust of new business clients.</p>

Table 6 Summary assignment question three, SWOT analysis (source: own table)

To answer the question on the challenges that Wiseair might encounter in expanding its presence in the B2B market, students should critically assess the aspects that Wiseair needs to modify within its operations or the skills and resources the team must integrate. Next, they should indicate possible solutions to address these challenges.

Students should look at the SWOT analysis previously conducted where they can use the weaknesses and the threats to come up with solutions to the challenges.

Regarding internal challenges, students should examine the need for increased knowledge and resources in developing the B2B service, along with the subsequent scaling efforts to cater to a wide customer base. Additionally, the complexities of establishing and nurturing relationships with B2B clients, distinct from their accustomed B2G clientele, should be taken into account.

As for external obstacles, students should consider potential competition that Wiseair may encounter in the B2B market, along with the economic influences that, as previously discussed in the literature review, can significantly affect the success of a green startup.

As to external concerns, students should address those on the fluid nature of regulations and the consequent necessity for adapting Wiseair’s service. Moreover, recognizing that B2B clients may have industry-specific requirements, Wiseair might need to customize the offer to align with distinct industry standards and establish credibility among new corporate clients. Also, economic factors and market entry barriers can become an obstacle for Wiseair success in the B2B market.

An overview of the challenges and possible solutions are presented next:

Challenges	Possible solutions
Limited B2B experience	<ul style="list-style-type: none"> • Hire experienced B2B professionals or consultants who can provide insights into the dynamics of the sector. • Consider partnerships or collaborations with established B2B players to gain industry knowledge.
Resource Constraint	<ul style="list-style-type: none"> • Seek additional funding through grants, investors, or loans to address capital constraints. • Efficiently allocate existing resources by prioritizing critical B2B initiatives. • Leverage technology for streamlined operations with limited human resources.
Scaling challenges	<ul style="list-style-type: none"> • Invest in scalable infrastructure and production capabilities to meet increased demand. • Develop flexible logistics and distribution systems to accommodate corporate delivery needs. • Consider outsourcing non-core functions to specialized partners.
Customer relationship management	<ul style="list-style-type: none"> • Implement a robust CRM system that allows for personalized communication and tracking of customer interactions. • Develop an account management strategy where dedicated sales representatives are assigned to B2B clients. This ensures a single point of contact for clients, enhancing trust and understanding of their specific needs.

	<ul style="list-style-type: none"> • Regularly engage with clients to gather feedback and understand evolving requirements. • Leverage data analytics to segment clients and tailor marketing and support efforts accordingly. • Provide ongoing training and resources to build strong, lasting relationships with clients.
Competition	<ul style="list-style-type: none"> • Clearly articulate Wiseair’s unique value proposition, such as advanced technology, sustainability features, or cost-effectiveness. • Develop a robust marketing and branding strategy to distinguish the company in a competitive landscape.
Economic factors	<ul style="list-style-type: none"> • Diversify the client base across industries to reduce vulnerability to economic fluctuations.
Changing of regulation	<ul style="list-style-type: none"> • Establish a dedicated compliance team to monitor evolving regulations and proactively adapt the offer and operations accordingly. • Engage with industry associations and governmental bodies to stay informed about upcoming regulatory changes.
Market entry barriers	<ul style="list-style-type: none"> • Invest in research and development to adapt the offer to meet industry-specific standards. • Leverage existing partnerships and client relationships to gain trust in the new business client segment. • Provide extensive documentation and case studies showcasing successful implementations.

Table 7 Summary assignment question three, challenges & solutions (source: own table)

7.5.5 Discussion wrap-up

At the end of the 50 minutes of in-group discussion, the instructor is advised to spend 20 minutes in conducting an in-class discussion where the different groups talk about the answers given to the two teaching questions for approximately 10 minutes per question.

After this, the instructor should spend the final 5 minutes to recap the key insights from the case study and the assignment question.

In the end, students should gain a comprehensive understanding of the green tech startup's role and the critical success elements involved. They should also be well-versed in the challenges such startups encounter on their journey to success.

8 Conclusions, recommendations and future research

The objective of this dissertation was to investigate the key factors that enable green tech startups to successfully establish themselves on the global market while balancing business and sustainability goals. This thesis has explored the case study of Wiseair, an Italian-based startup that promotes air quality through innovative solutions. The overarching teaching question centred around the identification of winning strategies for green startups' entrepreneurial success, while the teaching questions focused on Wiseair's positive integration of sustainable and economic goals, the specificities of Italian context, and challenges in expanding its presence in the B2B market.

Through an extensive literature review and an interview with Andrea Bassi, co-founder and Head of Sales at Wiseair, the analysis has identified several key success factors for green tech startups.

First of all, the development of a clear mission and vision is essential for green tech startups to communicate their purpose and values to stakeholders, and to guide their decision-making and strategic planning. Secondly, a focus on sustainability is also critical, as it ensures that the startup's products and services are aligned with environmental goals and contribute to a more sustainable future. Thirdly, a commitment to innovation is necessary to stay ahead of the curve and to develop new and better solutions to environmental problems. Fourthly, the human factor is key: a skilled and committed team is essential, as it provides the competences, expertise, and motivation needed to execute the startup's mission and vision. Finally, effective partnerships are vital to leverage resources, share knowledge, and achieve common goals.

By focusing on these key success factors, green tech startups can create innovative and sustainable solutions to environmental problems while also creating profitable businesses. It is hoped that this dissertation will inspire further research and innovation in this important field, and that green tech startups will continue to play a vital role in shaping our future. A particularly promising field for future research relates to the effects of "open innovation" for innovation activity in startups, especially in the current time of rapid digital technological development and the evolution of knowledge in the field of engineering, technology and management. In this regard, the recently published work of Audretsch et al. (2023), which looks into how open innovation enhances innovative activity in newly created firms through the contribution of external partners and their geographical location, could be further expanded to green startups. Future research in green tech startups should explore various business models' effectiveness, adaptability across contexts, and the role of partnerships. Additionally, rigorous longitudinal

studies must assess the environmental and social impact of these startups, guiding future policies and investments

Moreover, on the basis of the research findings, several practical recommendations can be made for green tech startups, policymakers, and investors.

First of all, green tech startups should prioritize sustainability and innovation in their business models and operations and seek to build strong partnerships with partners that share the same green values. Secondly, policymakers should create supportive regulatory frameworks and funding mechanisms that incentivize green tech startups and facilitate their growth and impact. Finally, investors should recognize the potential of green tech startups as a profitable and impactful investment opportunity and provide them with the necessary resources and support to scale up their operations.

9 Appendix

9.1 Interview script with Andrea Bassi

The following introduction and script are reported translated in English, as the interview was conducted in Italian.

Text message to Andrea Bassi on Telegram to introduce the topic of the thesis and ask for the interview.

“Hi Andrea. I am doing my thesis on Wiseair. It’s a case study entitled “The key success factors for green tech startups. The case study of the Italian-based startup Wiseair and the promotion of air-quality.” I have a few questions to ask you to complete the research. I hope you can help me by answering them. Thank you in advance!”

- Have you approached any consulting firms or environmental management experts for support in setting up your company?
- In the selection and recruitment phase, do you look for candidates who embrace your green mission? If yes, how do you verify that they are “green” people?
- What tools do you, as founders, use to promote and maintain a strong company culture? How do you have an effective “green entrepreneurial leadership”?
- Who are your suppliers and partners? Are these partnerships of high quality, based on a good relationship of trust and built with a long-term perspective? Do these companies you collaborate with share your green vision?
- How do your suppliers and partners help you achieve your goals, both economic and green?
- Do you organise training and environmental education courses for your supply chain partners?
- Regarding transport practices, material and finished product handling, and warehousing, are the partners you have chosen sharing and adopting green initiatives?
If yes, what are the advantages of having chosen these partners? Do you see the long-term cost/efficiency advantages of choosing partners that offer eco-efficient transport services?
- Regarding packaging materials, do you use recyclable materials, or do you adopt practices that make packaging greener? If yes, what are the benefits also in terms of cost?

- What are the obstacles you face in communicating with your partners? And what are the challenges a green company faces in creating a partnership system that shares the same principles?
- Have you found it difficult to communicate your green mission to your customers?
- What are the obstacles you face in communicating with customers?
- Is it also your mission to spread your green message to everyone? What are the tools you use to spread it?
- How many municipalities do you collaborate with today?
- What are Wiseair's future plans?
- How are you dealing with the B2B market expansion? What are the strengths of this strategy and what are the challenges?

10 References

- 2022-2023 EIB Climate Survey, EIB.org. <https://www.eib.org/en/surveys/climate-survey/5th-climate-survey/index.htm>. [Accessed 25 June 2023]
- A. Coman, B. Ronen, 2009. Focused SWOT: diagnosing critical strengths and weaknesses. *International Journal of Production Research*, 5677-5689.
- Agyemang, M., Zhu, Q.H., Adzanyo, M., et al., 2018. Evaluating barriers to green supply chain redesign and implementation of related practices in the West Africa cashew industry. *Resour. Conserv. Recycl.* 136, 209–222.
- Aldrich, H.E., Auster, E.R., 1986. Even dwarfs started small: liabilities of age and size and their strategic implications. *Res. Organ. Behav.* 8, 165–198.
- Ambec, S., & Lanoie, P., 2008. Does it pay to be green? A systematic overview. *Academy of Management Perspectives*, 22(4), 45–62. <https://doi.org/10.5465/AMP.2008.35590353>.
- Ambient (outdoor) air pollution. World Health Organization. [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health#:~:text=Ambient%20\(outdoor\)%20air%20pollution%20is,Asia%20and%20Western%20Pacific%20Regions](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health#:~:text=Ambient%20(outdoor)%20air%20pollution%20is,Asia%20and%20Western%20Pacific%20Regions). [Accessed 18 June 2023].
- Ametepey et al., 2015. Barriers to Successful Implementation of Sustainable Construction in the Ghanaian Construction Industry. *Procedia Manufacturing*, 3, 1682-1689. <https://doi.org/10.1016/j.promfg.2015.07.988>.
- Baker E. W., & Sinkula M.J., 2005. Environmental marketing strategy and firm performance: Effects on new product performance and market share. *Journal of the academy of marketing science*, 33, 461-475.
- Banerjee S.B, 2002. Organisational strategies for sustainable development: developing a research agenda for the new millennium. *Australian journal of management*. 27, 105-117.
- Barringer, B.R., Ireland, R.D., 2006. *Entrepreneurship- Successfully Launching New Ventures*. New Jersey. Prentice Hall.
- Baumol, W. J., 2010. *Microtheory of innovative entrepreneurship*. Kauffman Foundation Series on Innovation and Entrepreneurship. Princeton: Princeton University Press.
- Bergset, 2015. Green start-ups – a new typology for sustainable entrepreneurship and innovation research. *Journal of Innovation Management*
- Bergset, 2015. The Rationality and Irrationality of Financing Green Start-Ups. *Administrative Sciences* 5(4), 260-285.
- Bernstein, L., Bosch, P., Canziani, O., Chen, Z., Christ, R., & Riahi, K., 2008. IPCC, 2007: *Climate Change 2007: Synthesis Report*.
- Bhandari, D., Singh, R.K., Garg, S.K., 2019. Prioritisation and evaluation of barriers in- tensity for implementation of cleaner technologies: framework for sustainable pro- duction. *Resour. Conserv. Recycl.* 146, 156–167.

- Bos-Brouwers, H., 2010. Corporate sustainability and innovation in SMEs: evidence of themes and activities in practice. *Bus. Strat. Environ.* 19 (7), 417e435.
- Campiglio, E., 2016. Beyond carbon pricing: the role of banking and monetary policy in financing the transition to a low-carbon economy. *Ecol. Econ.* 121, 220–230.
- Charter, Martin, (1992). *Green Marketing- A Responsible Approach to Business*. U.K: Greenleaf Publishing.
- Chassagnon, V., & Haned, N. (2015). The relevance of innovation leadership for environmental benefits: a firm-level empirical analysis on French firms. *Technological Forecasting and Social Change*, 91, 194–207. <https://doi.org/10.1016/j.techfore.2014.02.012>.
- Chavan, M. (2005). An appraisal of environment management systems A competitive advantage for small businesses. *Management of Environmental Quality: An International Journal*. 16, 444-463.
- Choi, D. Y. & Gray, E. R. (2008). The venture development processes of “sustainable entrepreneurs”. *Management Research News*, 31(8), 558–569.
- Colombelli, A., Krafft, J., Quatraro, F. 2015. Eco-innovation and firm growth: do green gazelles run faster? Microeconomic evidence from a sample of European firms GREDEG Working Papers 2015-12, Groupe de REcherche en Droit, Economie, Gestion (GREDEG CNRS), University of Nice Sophia Antipolis.
- Darko, A., Chan, A.P.C., Yang, Y., et al., 2018. Influences of barriers, drivers, and pro- motion strategies on green building technologies adoption in developing countries: the Ghanaian case. *J. Clean. Prod.* 200, 687–703.
- David B. Audretsch, Maksim Belitski, Rosa Caiazza, Donald Siegel 2023. “Effects of open innovation in startups: Theory and evidence, *Technological Forecasting and Social Change*, Volume 194, 2023.
- Eisenmann TR, Parker G, Van Alstyne M, 2011. Platform envelopment. *Strateg Manag J* 32(12):1270–1285.
- Elkington J. 1997. *Cannibals With Forks: the Triple Bottom Line of 21st Century Business*. Capstone: Oxford.
- Epstein, J.M., & Roy, M., (2000). Strategic Evaluations of Environmental Projects in SMEs. *Environmental Quality Management*. 3, 37-47.
- Europe's air quality status 2023. European Environment Agency. [https://www.eea.europa.eu/publications/europes-air-quality-status2023#:~:text=Concentrations%20of%20PM2.5%20above,46%20air%20quality%20zones%2C%20respectively](https://www.eea.europa.eu/publications/europes-air-quality-status2023#:~:text=Concentrations%20of%20PM2.5%20above,46%20air%20quality%20zones%2C%20respectively.). [Accessed 10 July 2023]
- European Commission, official website. European Commission. https://commission.europa.eu/index_en. [Accessed 18 June 2023].
- European Environment Agency's. <https://www.eea.europa.eu/en>. [Accessed 16 June 2023]

- Fichter, K. & Weiß, R. (2013). *Start-ups: Product Pioneers for a Green Economy*. Berlin: Borderstep Institute for Innovation and Sustainability.
- Gagliardi, L., Marin, G., Miriello, C. 2016. The greener the better? Job creation effects of environmentally-friendly technological change. *Industrial and Corporate Change*, January. doi: <https://doi.org/10.1093/icc/dtv054>.
- Garcia-Muiña and Navas-López, 2007. Explaining and measuring success in new business: The effect of technological capabilities on firm results. *Technovation*, Volume 27, Issues 1–2, January–February 2007, Pages 30-46
- Ghisetti, C., & Quattraro, F. (2013). Beyond inducement in climate change: does environmental performance spur environmental technologies? A regional analysis of cross-sectoral differences. *Ecological Economics*, 96, 99–113.
- Global Startup Ecosystem Report, 2019. <https://startupgenome.com/reports/global-startup-ecosystem-report-2019>.
- Gray, E. R. & Balmer, J. M. T. (2004). *The Sustainable Entrepreneur*. Working Paper, 04(14). Bradford, UK: Bradford University School of Management.
- Greentech: i trend del 2023 secondo Terzo, 2023. *Rinnovabili.it*. <https://www.rinnovabili.it/le-aziende-informano/greentech-i-trend-del-2023-secondo-terzo/>. [Accessed 15 June 2023]
- Guo et al., 2020. Classifying green technologies for sustainable innovation and investment. *Resources, Conservation & Recycling*.
- Hall, B., Jaffe, A., Trajtenberg, M., 2001. *The NBER Patent Citation Data File: Lessons, Insights and Methodological Tools*. National Bureau of Economic Research, Cambridge, MA.
- Hartman, C. & Stafford, E., (1998). Crafting “Enviropreneurial” Value Chain Strategies Through Green Alliance. *Business Horizons*. 62-72.
- He, L., Zhang, L., Zhong, Z., et al., 2019. Green credit, renewable energy investment and green economy development: empirical analysis based on 150 listed companies of China. *J. Clean. Prod.* 208, 363–372.
- Hoff, P., 2012. Green tech innovation and diffusion: a financial economics and firm-level perspective. *Gabler*.
- J. Santisteban et al, 2007. Critical success factors for technology-based startups. *Int. J. Entrepreneurship and Small Business*, Vol. 42, No. 4.
- Konsek-Ciechonska, 2019. Startup Companies, Challenges in Poland. *Knowledge International Journal* 30(6):1621-1626.
- Krejci et al., 2015. Factors that influence the success of small and medium enterprises in ICT: A case study from the Czech Republic. *Business: Theory and Practice*, 2015, 16(3): 304–315.

- Kuckertz, A. & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions - Investigating the role of business experience. *Journal of Business Venturing*, 25(5), 524-539.
- Kuckertz, A., Berger, E.S.C., Gaudig, A., 2019. Responding to the greatest challenges? Value creation in ecological startups. *J. Clean. Prod.* 230, 1138–1147. <https://doi.org/10.1016/j.jclepro.2019.05.149>.
- Kuckertz, A., Wagner, M., 2010. The influence of sustainability orientation on entrepreneurial intentions - investigating the role of business experience. *J. Bus. Ventur.* 25 (5).
- La qualità dell'aria in Italia nel 2022 – Introduzione. SNPA Sistema nazionale protezione ambiente. <https://www.snpambiente.it/la-qualita-dellaria-in-italia-nel-2022/#:~:text=Nel%202022%20i%20valori%20limite,%2C%20con%20pochissime%20ocalizzate%20eccezioni>. [Accessed 18 June 2023].
- Le startup greentech italiane crescono del 42% - Startup-News. StartUP New. May 24, 2023. <https://www.startup-news.it/le-startup-greentech-italiane-crescono-del-42/>. [Accessed 12 June 2023].
- Liao, X., Shi, X., 2018. Public appeal, environmental regulation and green investment: evidence from China. *Energy Policy* 119, 554–562.
- Luthra, S., Kumar, S., Garg, D., et al., 2015. Barriers to renewable/sustainable energy technologies adoption: Indian perspective. *Renew. Sustain. Energy Rev.* 41, 762–776.
- Mal'aria di città, Legambiente. March 20, 2023. <https://www.legambiente.it/rapporti-e-osservatori/malaria-di-citta/> [Accessed 15 June 2023].
- Malerba, F. (2005). Sectoral systems: how and why innovation differs across sectors. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford handbook of innovation* (pp. 380– 406). Oxford: Oxford University Press.
- Marilyn M. Helms, Judy Nixon, 2010. Exploring SWOT analysis – where are we now? A review of academic research from the last decade. *Journal of Strategy and Management*.
- Marra, Antonelli and Pozzi, 2017. Emerging green-tech specializations and clusters – A network analysis on technological innovation at the metropolitan level. *Renewable and Sustainable Energy Reviews*, 67, 1037-1046.
- Misani, N., & Pogutz, S. (2015). Unraveling the effects of environmental outcomes and processes on financial performance: a non-linear approach. *Ecological Economics*, 109, 150–160.
- Murillo-Luna, J.L., Garcés-Ayerbe, C., Rivera-Torres, P., 2011. Barriers to the adoption of proactive environmental strategies. *J. Clean. Prod.* 19 (13), 1417–1425.
- N. K. Mustaffa et al., 2022. SWOT Analysis of Green Technology Application for the Development of Low Carbon Cities. *Green Infrastructure*, 212-224.
- Nair, S. R (2004). Challenges to the practice of environmental marketing. In Nadungar, R. & Panda, T. K. (Eds) *Marketing Strategies for Emerging Markets*. New Delhi: Excell.

- Namugenyi et al, 2019. Design of a SWOT Analysis Model and its Evaluation in Diverse Digital Business Ecosystem Contexts. ScienceDirect. Procedia Computer Science 159 (2019) 1145–1154.
- Ndubisi, N.O. and Chukwunonso, N.C. (2005). Diffusion of Landscaping Services in Organisations: A Two Nation Study of Determinant Factors, Management of Environmental Quality: An International Journal, 16(4), 291- 308.
- Nelson Oly Ndubisi et al., 2009. *Green Entrepreneurship (GE) And Green Value Added (GVA): A Conceptual Framework*. International Journal of Entrepreneurship 13:21-34.
- Oltra, V., & Saint Jean, M. (2009). Sectoral systems of environmental innovation: an application to the French automotive industry. Technological Forecasting and Social Change, 7, 567–583. <https://doi.org/10.1016/j.techfore.2008.03.025>.
- Osukoya, K. (2007). Enterprise: Small Firms See Big Potential in Going Green; Consumer Concerns And a Desire to Buy Locally Boost Sales. Wall Street Journal. (Eastern edition). N.Y.:Jun 12, 2007. pg. B.4
- Parrish, B. D. (2010). Sustainability-driven entrepreneurship: Principles of organization design. Journal of Business Venturing, 25(5), 510-523.
- Partnership Wiseair e ARPA Sicilia, i primi risultati della sperimentazione, 2021. <https://www.arpa.sicilia.it/partnership-wiseair-e-arpa-sicilia-i-primi-risultati-della-sperimentazione/>.
- Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., Abrahamsson, P, 2014. Software development in startup companies: a systematic mapping study. Inf. Softw. Technol. 56(10), 1200–1218
- Pernick, R., & Wilder, C., 2007. The clean tech revolution. HarperCollins.
- Polonsky, M. J. (1995). “A Stakeholder Theory Approach to Designing Environmental Marketing Strategy.” Journal of Business & Industrial Marketing, 10, 29-46.
- Porter, M.E.,& van der Linde (1995). Green and competitive: ending the stalemate. Harvard Business Review, 73, 120-33.
- Reckien, D., Salvia, M., Heidrich, O., Church, J.M., Pietrapertosa, F., De Gregorio- Hurtado, S., D’Alonzo, V., Foley, A., Simoes, S.G., Krkořska Lorencova’, E., Orru, H., Orru, K., Wejs, A., Flacke, J., Olazabal, M., Geneletti, D., Feliu, E., Vasilie, S., Nador, C., Krook-Riekkola, A., Matosović, M., Fokaides, P.A., Ioannou, B.I., Flamos, A., Spyridaki, N.A., Balzan, M.V., Fülöp, O., Paspaldzhiev, I., Grafakos, S., Dawson, R., 2018. How are cities planning to respond to climate change? Assessment of local climate plans from 885 cities in the EU-28. J. Clean. Prod. 191, 207–219.
- Sàez-Martínez, F. J., Díaz-García, C., & Gonzalez-Moreno, A., 2016. Firm technological trajectory as a driver of eco- innovation in young small and medium-sized enterprises. Journal of Cleaner Production, 138, 28–37. <https://doi.org/10.1016/j.jclepro.2016.04.108>.
- Sarkis, J. et. al., (2004). E-logistics and the Natural Environment. Supply Chain Management: An International Journal 9, 303-312.

- Schaltegger, S. & Wagner, M. (2011). Sustainable Entrepreneurship and Sustainability Innovation: Categories and Interactions. *Business Strategy and the Environment*, 20, 222-237.
- Sensirion web-page at: <https://www.sensirion.com/>, [Accessed 17 June 2023].
- Shepherd, D. A. & Patzelt, H. (2011). The New Field of Sustainable Entrepreneurship: Studying Entrepreneurial Action Linking ‘What Is to Be Sustained’ With ‘What Is to Be Developed’. *Entrepreneurship Theory and Practice*, 35(1), 137–163.
- Simpson, D. et al. (2007). Greening the Automotive Supply Chain: A Relationship Perspective. *International Journal of Operations & Production Management*. 27, 28-48.
- Srivastava, P. (1995). Environmental Technologies and Competitive Environment. *Strategic Management Journal*. 16,183-200.
- Stafford, E.D., Harthman, C.L. (1996). Green Alliance: Strategic Relationship between Business and Environmental Groups. *Business Horizons*. 39, 50-59.
- Stafford, E.D., Polonsky, M.J., Harthman, C.L. (2000). Environmental NGO-Business Collaboration and Strategic Bridging: A Case Analysis of the Greenpeace – Foron Alliance. *Business Strategy and the Environment*. 9, 122- 135.
- Statista, 2023. Green Technology and Sustainability Market Size Worldwide from 2021 to 2030.
- The National Recovery and Resilience Plan. Agenzia per la coesione territoriale. <https://www.agenziacoesione.gov.it/comunicazione/piano-nazionale-di-ripresa-e-resilienza/?lang=en#:~:text=The%20National%20Recovery%20and%20Resilience%20Plan%20outlines%20the%20objectives%2C%20reforms,competitive%2C%20dynamic%20and%20innovative%20economy.> [Accessed 18 June 2023].
- Theyel, G.(2000). Management Practices for Environmental Innovation and Performance. *International Journal of Operations & Production Management*. 20, 249-266.
- Wakeford, J.J., Gebreyesus, M., Ginbo, T., et al., 2017. Innovation for green industrialisation: an empirical assessment of innovation in Ethiopia’s cement, leather and textile sectors. *J. Clean. Prod.* 166, 503–511.
- Wu, H. & Dunn S. C. (1995). Environmentally Responsible Logistics Systems. *International Journal of Physical Distribution & Logistics Management*. 25, 20-38.
- Xia, D., Zhang, M., Yu, Q., et al., 2019. Developing a framework to identify barriers of Green technology adoption for enterprises. *Resour. Conserv. Recycl.* 143, 99–110.
- Yoshino, N., Taghizadeh-Hesary, F., Nakahigashi, M., 2019. Modelling the social funding and spill-over tax for addressing the green energy financing gap. *Econ. Model.* 77, 34–41.
- Zutshi, A. & Sohal A. S. (2004) Adoption and Maintenance of Environmental Management Systems - Critical Success Factors. *Management of Environmental Quality: An International Journal*. 15, 399-419.