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I, Bart Neuts, as supervisor of the student Laura Salfi, hereby APPROVE the thesis entitled “**The Fostering Factors for Green Innovation: An Analysis of European Hotspots and their Relationship with the European Green Deal**”.

Place Leuven, Date 07/02/2023

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A handwritten signature in blue ink, appearing to read 'Neuts', is written over a horizontal line. The signature is stylized and extends downwards and to the right.

# The Fostering Factors for Green Innovation: An Analysis of European Hotspots and their Relationship with the European Green Deal

Supervisor: **Prof. Bart Neuts**

**Laura SALFI**

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fulfillment of the requirements  
for the degree of Master of Science  
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I would like to dedicate this work, for how much it could mean, to Andrea, a sweet soul in this rough world. I hope, and will work, for a better tomorrow.

*Laura Salfi.*

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# Abstract

The aim of this study is to provide insights on the factors that foster green innovation, and understand how such dynamics relate to the overarching framework of the European Green Deal. Those points are analysed by screening the presence of successful green startups in the Union and assessing which factors enable their growth, with a focus on their relationship with innovation funding provided by European Institutions within the political framework of the European Green Deal. Through a combined quantitative and qualitative approach, This study examines the elements that facilitate green innovation in specific European contexts, with the objective of developing a suite of legal and financial support tools to promote green innovation across Europe.

**Keywords:** Green Innovation, European Innovation Ecosystems, European Green Deal, Startups

## Version Française

L'objectif de cette étude est de fournir un panorama des facteurs qui favorisent l'innovation verte, et de comprendre comment ces dynamiques sont liées au cadre général du Green Deal européen. Ces points sont analysés en examinant la présence des startups vertes de succès dans le territoire de l'Union et en évaluant quels facteurs permettent leur croissance, en mettant l'accent sur leur relation avec le financement de l'innovation fourni par les institutions européennes dans le cadre politique du Green Deal européen. Grâce à une approche quantitative et qualitative combinée, cette étude examine les éléments qui facilitent l'innovation verte dans des contextes européens spécifiques, avec l'objectif de développer une série d'outils de soutien juridique et financier pour promouvoir l'innovation verte à travers l'Europe.

**Mots-clés :** Innovation verte, Ecosystèmes d'innovation, Green Deal européen, Startups



# Chapter 1: Introduction

## **Presentation of the issue**

This study aims to gain a comprehensive understanding of the current state of green innovation in Europe and to identify the underlying factors that contribute to its creation. To accomplish this, the research will begin by conducting a thorough review of existing literature on innovation ecosystems, green innovation, and the European funding systems that support innovation. Subsequently, a mapping of current green innovation hotspots will be conducted by reviewing various web-based rankings of the top-performing green startups in the industry. This is of particular relevance as green startups are considered the primary drivers of green innovation, both in terms of creating new products and services, as well as reshaping market demand and supply. In order to further examine the factors driving green innovation, a qualitative approach will be adopted. This will include conducting semi-structured interviews with green startups located in the identified hotspots, as well as assessing the impact of EU funds for innovation on their development. The findings will then be discussed, leading to several conclusions that provide valuable insights into the impact of European policies for innovation on bottom-up green innovation and strategies for fostering its growth.

The core aim of this study is indeed to answer the research question: "What are the factors that drive green innovation in European startups and how do EU funding systems for innovation impact the development of these startups in the identified green innovation hotspots?"

## **1.1 Research question and objectives**

In the light of the ongoing climate crisis, both institutional and commercial actors are eager to find solutions to mitigate and reverse its catastrophic effects. Scientific evidence is pushing both politicians and corporations to rethink current paradigms, from regulations to supply chains. The violence and frequency of climate-related disasters indeed spurs actors to not just design, but quickly implement sustainable innovations at large scale. Under such pressures, regulations and funding opportunities are being designed by national and supranational institutions, while technological discoveries and business models innovations are being developed by practitioners. In order to be concrete and effective, those innovation processes demand strong and fluid collaborations between institutional actors and the business world. On the one hand, corporate practices represent a dynamic ground for innovation implementation: industries, businesses and corporations are indeed among the most relevant agents affecting environmental hazards and, therefore, the most effective drivers for structural socio-economic changes. On the other hand, national and supranational public institutions can stimulate or at the contrary obstruct systemic changes and sustainable development. Against this background, analysing the relationships between innovators and institutions while focusing on the main drivers that foster green innovation, is of fundamental importance. Namely, understanding which factors promote the birth and development of green innovation can identify those drivers that leverage the development of green entrepreneurship. The term "Green innovation" synthesises a complex series of dynamics and factors that have among the a strong influence on financial growth, societal habits, and quality of life at the same time (Akbari et al. 2022). In

fact, in order to develop and implement solutions that can mitigate global warming consequences and prevent other forms of issues, a strong collaboration between institutions, researchers and incumbent firms is not enough. Such prerogatives underline the importance of having a strong network between researchers, green startups, incumbent firms and institutions.

Such a complex grid is called by scholars and entrepreneurs as a "green innovation ecosystem". Innovation ecosystems are indeed intended as a "setting of multiple independent actors that jointly create value in an environment that stimulates organic ecosystems where firms and other actors cooperate and compete" (Marcon et al. 2021, p. 586). Many authors recently underlined how innovation ecosystems that specifically focus on green innovation are growing both in terms of relevance and actors involved. Indeed, the World Economic Forum in its publication on global renewable energy investments highlighted how in the last six years investments in renewable energies and green technologies increased at a very high speed (World Economic Forum, 2022). Those data also remark regional differences, underlining that advanced economies like the USA, China and Europe are forging ahead in sustainability-related spending (ibid.). It is in this light that even before the war the European Union intensified the commitment for the sustainable development of its member states: following several climate-focused policies, notably the Paris Agreement, the "European Green Deal" was presented by the European Commission in 2019, crowning its determination in increasingly decarbonizing the Union. In this framework, not just institutions but entrepreneurs, startups and investors play a fundamental role in designing products, services and projects to achieve the "net zero" targets (European Commission A, 2022). Furthermore, besides pollution and awareness concerns, the University of New South Wales highlighted how the reduction of reliance and dependency from Russian resources pushed European investors and institutions to accelerate even more the switch to renewable solutions. (UNSW, 2022).

All those factors underline how simply assessing the presence of green startups in a specific region does not provide a comprehensive understanding of the broader landscape of green innovation in Europe. To truly grasp the motivations and drivers behind such developments, it

this study aims to delve deeper into the underlying factors of green innovation, namely targeting:

- **Which are the best-performing countries in terms of green innovation in Europe?**
- **Which are the factors that back such a performance?**
- **How is Europe contributing to the development of green innovation, considering the objectives of the European Green Deal?**
- **How are green startups contributing to the achievements of the Green Deal's aims? Is the relationship between the two "efficient"?**

Those sub-questions are formulated in order to tackle the main issue of this analysis: "What are the factors that drive green innovation in European startups and how do EU funding systems for innovation impact the development of these startups in the identified green innovation hotspots?". Indeed, given the European Union's objective to transition towards a net-zero economy by 2050, it becomes crucial to assess the extent to which these efforts contribute to the advancement of green innovation entrepreneurship, a crucial factor in achieving this objective.

## **1.2 Significance of green innovation dynamics within the framework of the Green Deal**

Considering the above-mentioned framework and the prominent factor of sustainability, it becomes crucial to invest research specifically on green innovation ecosystems. In such a frame, as innovators need an environment which undergirds its existence, innovation ecosystems and their relationship with institutions holds a pivotal importance. The increasing volume of financing on the green economy enhances the importance of investigating not only such issues, but also the peculiar characteristics of green startups, which are often considered as the cornerstone of innovation (Speckemeier & Tsvirikos, p. 1). In fact, such entities working

on sustainability issues, face a twofold challenge: while aiming at scaling up their solutions and obtaining market value, they also have to remain coherent to their sustainability and ethical principles. (Zhilkina et al. 2020). Indeed, startups are often considered as the cornerstone of innovation and therefore of development. (Speckemeier & Tsivrikos, p. 1) The processes that determine the creation, development and success of such entities are therefore much more complex than the ones of non-sustainable businesses, also because workers engaging in such challenges demand certain characteristics that have to comply with the startup policies and morals (Mousavi, 2017, 1263–1275)

Namely, looking at the European regions with the highest number and best-rated startups focusing on sustainable development, allows to detect the formation of "green innovation hotspots". Considering the importance that green innovation ecosystems have, as well as to understand agglomeration dynamics, it becomes essential to study which factors determine the birth of green startups and foster their development. Considering the European framework, it is also important to understand the extent to which European Institutions are part of those processes. As mentioned before and highlighted by several scholars like Zhilkina et al. (2020), public institutions can sustain or hamper green entrepreneurship: understanding how their principal components, green startups, are impacted by institutions is therefore of pivotal importance.

The European Green Deal appointed a set of funds to follow in order to achieve the net-zero emissions balance in 2050: are those measures impacting sustainable-focused startups? Which factors foster the decarbonisation of the union and who are the main drivers in this transition are indeed the two compelling interrogatives to use in the analysis of the relationship between Institutions and innovators. Thus, taking into account the European scale, it becomes interesting to look at the role that green innovators have in the framework of the European Green Deal.

## 1.3 Problem discussion and contribution to current literature

The main factors fostering the creation of green startups and their relationship with the Union are an important topic of study that only recently came to light: with the growth of consumer's awareness on climate-related issues, the balance that green entrepreneurs have to manage between sustainability and marketability became a topical issue. Inserting a product or a service in market structure composed by many actors and processes against green solutions' implementation implies a great challenge for green startups (Melander, 2018). This archetype of green startups differentiates them from average businesses, highlighting the importance of those studies that focus on such peculiar actors (ibid). Furthermore, as it will be further illustrated, most of the current literature uses a quantitative approach for understanding the impact of different factors on green entrepreneurship, without deeply delving into a comparative qualitative analysis. In this framework, analysing the main factors that trigger green startups growth in different European contexts is of fundamental relevance, moreover, the relationship of green startups with the European sustainability-oriented policies bring to light both the latter's effectiveness and limits, allowing a fairly new and bottom-up perspective on the impact that such measures have on the real green innovation economy. Such themes tackle not only sustainable development processes, but also the new challenges posed by the Ukrainian war, concerning energetic independence. This study indeed proposes some considerations on the potential of green startups, and namely on the systemic changes that it could bring within the current productive framework.

## 1.4 Analysis approach

Europe has been chosen as scope since its countries are often ranked among the top-performing countries concerning sustainable-development-related innovations and progress for the 17 UN

SDGs achievement. (Speckemeier & Tzivrikos, 2022). Furthermore, in the "Green Future Index 2022" developed by the World Economic Forum, Europe stands out thanks to the best sustainability-performing countries in the world, presenting the highest indices of spending for sustainable development with 16 Countries in the global top 20 positions. (World Economic Forum Website, 2022). To further understand how sustainable startups are created and grow within the Union, a mapping displaying the "best performing green startups" in Europe has been created using quantitative data from web rankings. To frame the research in academic terms and conceptualise the issues, this study employs knowledge spillover and hub creation theories from academic literature, as well as current institutional sources concerning the legal and financial framework supporting the Green Deal. The results aim to provide insights into the current framework of green innovation, highlighting its main characteristics and levier: though those elements, such findings can also be a useful tool for European and non-European policymakers, as they display the main factors that help the development of green startups, fueling the innovation ecosystems in which they operate.

The results aim to provide insights on the current European green innovation framework, highlighting its main characteristics and drivers, with a potential utility for European and non-European policymakers aiming at fueling the innovation ecosystems in which they operate.

## Chapter 2: Literature Review

## 2.1 The European Green Deal's legal and financial framework

The effects of climate change became increasingly evident on a global scale, for both the frequency and magnitude of extreme weather events. In Europe such events were also followed by social and political movements (for example, Fridays for Future), which especially in Western states put emphasis on public opinion's concerns about such issues. Decarbonisation and climate change awareness started indeed being part of the political agendas of policymakers on both national and communitarian scale (Nevett, 2021). The year 2005 saw the introduction of the "Emissions Trading Scheme", in acronym "ETS", one of the most important policies adopted in all European countries (plus Iceland, Liechtenstein and Norway) aimed at reducing Greenhouse Gases (GHG) from both air transportation and industrial production of goods and energy (ISPRA, 2016). In 2007 the "European Climate and Energy Policy Framework" was created in order to cover those areas left aside in the Emission Trading Scheme, resulting in the adoption of measures to reduce GHG in transport systems at large, agriculture, waste and building industries. The Paris Agreement of 2015 then marked an important milestone in the European race towards sustainability, aiming to prevent several environmental hazards not just in the Union but at a larger international scale (Lindberg, 2019). With the main objective of keeping the global temperature rise below 2 celsius degrees, 148 countries signed the deal, sharing among others the engagement on checking and strengthening climate action each five years, marking a success for European Diplomacy. (Gray, 2016). In this context, the anti-climate policies put in place by influential heads of states like Donald Trump in the United States or Jair Bolsonaro in Brazil further motivated European political actors to strengthen the targets and prioritise green policies (Pickering et al., 2020).



### **2.1.1 The European Green Deal's overarching aims**

“I want Europe to become the first climate neutral continent in the world by 2050” were indeed the words pronounced by the president of the European Commission Ursula Von der Leyen at the European Commission in Brussels on the 11th December 2019, when the "European Green Deal" was presented. (European Commission A, 2022). With those words, Europe flagged its ambition and engagement to start a series of structural changes on a wide scale, shifting from the current paradigms ruling the economical, institutional and societal schemes, to more sustainable ones. The very core of the policies is in fact to prioritise sustainable policies, enlarging their scope of action: the aim is to transform the Union into a resource-efficient and carbon-neutral economy, balancing the emissions of carbon dioxide by sequestration procedures while implementing innovative solutions to move from linear business models toward circular ones. (European Parliament A, 2021). As previously mentioned, at the time the Union was seeing not only the outbreak of policies against climate protection in relevant nations, but also an internal disgregation process: the Brexit and the populist movement in many European states further incentivised relaunch of integration policies, unifying the member's development under a communitarian journey towards sustainability (Bongardt et al. 2021). The European Green Deal (henceforth "Green Deal") can indeed be pictured as a communitarian agreement on "an economic growth decoupled from resource use" , based on four pillars: sustainable investment, industrial policy, carbon pricing and a just transition (European Parliament A, 2021). The massive changes needed in order to cope with such a perspective, allowed the European Commission to draft a set of essential milestones that, displayed in a roadmap leading to 2050, mark with clear targets this ambitious journey (European Commission B, 2021). This roadmap entails several thematic areas, such as environmental protection, clean mobility, clean energy, environmental pollution elimination, sustainable and circular industry, and a fair, healthy and environmentally friendly food system. (European Commission A, 2020).

## 2.1.2 Legal measures

At first, the Green Deal didn't include a binding set of laws itself, but was rather as a set of measures and guidelines to orient the communitarian development towards climate neutrality in the next decades (Fetting, 2020). Those measures were designed in line with the economic context and the level of fossil fuel's dependence on each member state. (ibid.) To cope with those structural and geopolitical differences, the month after the presentation of the Green Deal the "Just transition mechanism" and the "Just transition fund" were presented: those two regulatory systems were indeed designed to secure those countries highly reliant on fossil fuels to meet the relatively high costs of energy transition, ensuring a fair and even development. (World Resources Institute, 2021). After the milestones were set and shared by member states, the following years saw the European Commission paving the way towards net zero by presenting different strategies, laws and operational frameworks covering several influential sectors. Probably the most important step in this frame was the enforcement of the main Green Deal objectives through the creation of the "Climate law". This first set of legally binding measures focuses on the concretisation of one of the most relevant targets of the Green Deal: cut GHG emissions by 55% before 2030, compared to 1990's levels (European Commission, C). This target has an important political and economic value, since it requires incumbent governments to enforce concrete measures in a short time-spectrum and industries to quickly adapt to new regulations (Siddi, 2020). The binding measures within the Climate Law are now under negotiation processes in order to allow European and National policy-makers to bring the current legislation in line with their legal ecosystem (European Parliament B, 2022). In these regards, the package offers a set of impact assessment tools to follow each national energy and climate plans, auditing improvements and omissions with the help of an ad-hoc Scientific Advisory Board on climate change (European Commission, B). In order to enforce the Climate Law implementation and stress the decrease by 55% GHG emissions before 2030, in July 2021 the European Commission created the so-called "Fit for 55" Package. This set of measures, embedded in the Green Deal frame, aims at implementing the Climate Law's overarching target

by ensuring the updating of the EU climate legislation, leveraging the creation of new communitarian and national laws. (EIT Climate Kic, 2021).

The recently approved Corporate Sustainability Reporting Directive (CSRD) officially entered the EU legal regulatory framework, with the aim of leveraging European Institutions power in guaranteeing GHG emissions reporting. The previous measure, called "NFRD", requested commercial actors to provide emissions reportings that had no financial relevance and no binding force over governments or corporations. (Deloitte, 2022). The CSRD on the contrary, will force businesses and organisations to declare their GHG emissions in a yearly report, which will be audited by independent bodies and have the same legal value as tax returns (European Commission D, 2022).

### **2.1.3 Political overview**

In this picture, the impact of the Covid-19 pandemic and the subsequent recovery plans deserve mentioning. Right after the announcement of the Green Deal, the Covid-19 outbreak allowed new priorities to overcome its objectives. The Commission and member states had to face unprecedented challenges that conditioned the development of the net-zero targets. The harsh conditions in which the industrial sector had to operate also overshadowed climate friendly policies. Still, the pandemic did not compromise the overall application of the Green Deal measures, on the contrary it unlocked new opportunities for disruptive innovation processes, paving the way towards sustainability-oriented systems regeneration (European Investment Bank, 2021). Both the private and the public sector saw new types of financing being offered for their development: in Europe, communitarian institutions worked to leverage the post-pandemic recovery by fixing new targets and presenting new monetary packages, with a focus on resilience and sustainability.

## 2.2 Green Deal's main financial mechanisms

### 2.2.1 The cost of reaching net-zero

The consulting group McKinsey estimated that it will cost over \$275 trillion in total to invest in physical assets over the next three decades in order to achieve net-zero greenhouse gas (GHG) emissions by 2050 (Krishnan et al., 2022). To bridge the gap between today's context and the net-zero targets, investments need to be made in all directions, from research and innovation, to agriculture, urban planning, health and education. It is evident therefore the importance of investing in physical and intellectual capital: raising funds to face climate disasters, supporting research and innovation or promoting sustainability-oriented projects mark the dual nature that characterise green investments: ensuring returns on investments while protecting the environment (Heinrich Böll Foundation et al., 2022). In this framework, the EU Budget is one of the main sources of investment: the ensemble of funds available is called "Multiannual Financial Framework" (MFF) and is planned and spent under a seven-year spectrum. (Gancheva et al., 2021). Such a budget, aside from covering the operational expenses of European bodies, supports the pursuit of different European policies and is managed by different institutions depending on the sector of application (ibid.). A significant part of this MFF budget will be allocated to programs that address the environment and tackle climate change, following the Green Deal's milestones: with the name of "Sustainable European Investment Plan" or "Green Deal Investment Plan", this section provides 503 billion euros of investments specifically targeting climate and environmental protection (European Commission, E). Furthermore, the Plan aims at mobilising at least one trillion euros for sustainable investments over the next ten years. (ibid).

### 2.2.2 Financial measures

EU funds can be **managed in different ways**: directly by the European Commission, by entrusted institutions (e.g. the EIB) under an "indirect management" plan, or through a "shared management" process, in which the Commission collaborates with member states in the allocation and handling of funds. (Gancheva et al., 2021). In order to be eligible, a project needs to contribute to at least one of the six targets shared in the "European Taxonomy, a labelling tool presented in 2020 by the European Commission. **The European Taxonomy**, often simply called "Taxonomy" serves as a guide to classify which economic activities or financial products can be classified as "sustainable" or "green" (European Corporate Sustainability and Responsibility Organisation, 2021). To perform a clear classification, a set of targets were defined to address both power and environmental objectives: articles in the taxonomy regulation and criteria in delegated acts indeed define thresholds for economic activities or services, distinguishing between the ones that "do not significantly harm" the environment and others that instead give a "positive contribution" (European Parliament C, 2022). In the next decades the most polluting activities, those underneath the "do not significant harm" threshold, will be urgently pushed to transitioning to more sustainable productions through regulations, laws and financial incentives. In this context, those enterprises which are almost totally dependent on polluting activities, like solid fossil fuels production or highly-pollutant chemical producers, will have to face a total reorganisation of their production, if not a complete shut-down. (Climate Bonds Initiative, 2021) To cope with those difficult processes, the identification of such fossil-fuel-dependent activities and the standardisation for a just transition mechanism are, and will be, the main focus of the EU Commission Green Deal programmes (ibid.).

### 2.2.3. The Carbon Border Adjustment Mechansims

One of the most impactful measures of the Fit for 55 Package is the "Carbon Border Adjustment

Mechanism" (CBAM), a mechanism aimed at increasing the costs of some imported commodities that are exempt from the ETS producers' expenses for climate protection. (European Climate organisation, 2022). The intention is to encourage non-EU nations to set their own CO2 prices and reassure the manufacturers of the European bloc that the Emission Trading System won't adversely affect them. To this regard, the Commission suggested that the CBAM should begin in 2026, after a transitional period (2023–2025) that includes reporting obligations for EU importers (ibid). Looking at those measures, it appears clear how the European Green Deal is a complex body composed of different parts that move at different speeds (EUcalls, 2022).

#### **2.2.4. Research and innovation funds: Horizon Europe**

One often used funding mechanism for sustainable development and innovation seems to be the "Horizon Europe" program, which falls under the "directly managed" funds (Gancheva et al., 2021). In the time frame of 2021-2027 the European Parliament has suggested a budget of €120 billion, compared to the €95,5 billion initially planned by the European Commission, with a 35% of the budget precisely targeting research on green technologies and biodiversity protection (European Court of Auditors, 2021, p. 302-309). Horizon Europe is one of the most important Green Deal branches for innovation, with over 10 thousand supported projects and an expanding network (Negreiros & Flaconer, 2021, p.54; European Project Dashboard). One example is the Net Zero Cities project, that aims at reaching net zero carbon emissions before 2030, connecting 100 European cities to join efforts and talents in this journey (NetZeroCities.eu, 2023).

Still, aside those achievements, the European Committee of the Regions, in their report on the implementation of the Green Deal, highlights how such a programme, like other directly managed EU funds, puts in competition too many actors that try to win project calls, creating

a non-optimal innovation groundwork that favours "larger or more experienced entities" who have more training in answering bureaucratic requirements with respect to smaller actors with less available tools and experience in preparing such applications. (Gancheva et al., 2021, p.11).

### **2.2.5 Post Pandemic recovery funds**

In addition to the above-mentioned packages, the European Commission activated a recovery fund to foster the post-pandemic restoration under a "more sustainable, resilient and fairer" perspective called "Next Generation EU", which provides funds for green innovation mainly in the form of grants. (Gancheva et al., 2021). In this picture, the Commission also increased the climate-related spending on both the Next Generation EU and the Multiannual Financial Framework, from 20% up to 30%, in order to mainstream climate change across all areas of spending (ibid). Within the framework of the Next Generation EU, the Commission introduced a financial instrument called "Recovery and Resilience Facility", which helps member states to overcome the pandemic and build stronger economic activities through a set of funds entrusted by the European Investment Bank, devoted to projects focused on sustainability and green innovation (EIB.org).

## **2.3 The increasing relevance of green-oriented financial mechanisms**

In this picture, green finance is at the very core of the transition. To answer this need, in 2007 the European Investment Bank (EIB) issued the first "Climate Awareness Bond" (CAB), a financial tool that implies a "use of proceeds clause", which specifies that the funding will be used for green investments (Maltais; Nykvist, 2020). Within the InvestEU programme, the EIB

plays a fundamental role in working for the de-risk of private investment in green solutions by reorienting flows of equity towards sustainable innovation (European Commission F, 2020). In this frame, although the literature underlines that the Green Bonds market still only accounts for roughly 3% of total bond issuance, their use is increasing, representing a viable instrument, also thanks to the accountability on their financing and transparency on their impact (European Public Real Estate Association, 2021). In an European outlook, the Climate Bonds Initiative spots France as the major CAB issuer, followed by Germany (Climate Bonds Initiative, 2019, p.3.), with transports, energy and buildings being the main sectors of expenditure in 2019 and transport, energy and water for 2020 (CBI, 2019, p.14; CBI, 2020, p. 7). Namely, the creation of the European taxonomy should allow a further enhancement of green finance flows towards sustainable activities to push for green expenditures. In this path, the Commission underlines how there are different levels of priorities, but all actors will have to make a transition (Climate Bonds Initiative 2020). To attract finance to support this type of transition, the Commission is extending the areas of action of the taxonomy, aiming at positioning any economic activity in the "pollution-performance" threshold scheme. (Climate Bonds Initiative, B, 2022). In this frame, in which governments are issuing green sovereign bonds and public actors are establishing climate targets, both public and commercial players have created numerous classification systems for sustainability, resulting in a lack of objectivity and comparability (Schütze; Stede, 2021). Also, Claeys, Tagliapietra and Bruegel (2019) argue that for InvestEU to be the real financial engine for the Green Deal, the threshold and guidelines for sustainability need to be clearer and stricter, as currently many projects that received funds through the InvestEU programme were "high-carbon projects".

As it emerges from the whole picture above described, there are several incentives and tools on both the legal and financial sides that can positively influence the race towards a net-zero economy in Europe. Nevertheless, those tools can be improved: many authors like Schütze and Stede (2021); Maltais & Nykvist (2020) or Naeem et al. (2021) empathise indeed how for example green bonds are a rather "traditional innovation" in finance, as they don't seem to bring in new types of sources of funding, nor easing the green transition at the estimated level,



resulting not that impactful in terms of shifted capital. Furthermore, Cadman and Sarker (2022) in their “Handbook of Sustainable Development and Finance” flag the high extent to which the fragmented framework of environmental metrics, taxation and regulation is hampering sustainable innovation to improve and level off.

In general, it must be emphasised that encouraging disruptive innovation will demand a large number of risk-taking decisions, and with that, several failures. In this light, it’s important to notice the need for a high-quality lead in the transition, for which often innovative technologies are needed. Many scholars (e.g. Bendig et al. 2022) in fact emphasise the need for strong investment policies and fund packages for green innovation, that could sustain entrepreneurs and researchers while providing solutions to private or public actors simultaneously.

## **2.4 Innovation Ecosystems**

### **2.4.1 Defining the concept of Innovation Ecosystems**

Baiyere's (2018) analysis on Innovation Ecosystems delves into the issue of their definition, highlighting how such a concept has gained widespread usage but lacks a clear and agreed-upon concept among scholars. This is because of the various interpretations of the term, often due to tensions between the academic and business realms (Oh et al., 2016). Namely, Akberdina and Vasilenko, in their analysis on Innovation Ecosystem as a Multi-Component Concept (2021, p.5 ), study the fundamentals of the concept, namely referring to: the seminal unit of the ecosystem seen as the "manager" of the ecosystem access; the external agents; the relationship between the ecosystem members; their level of interdependence and main goal; the benefits from being part of the ecosystem and its dynamism. Following the evolution of the innovation ecosystem usage, the authors state that for describing what is an innovation ecosystem it is not enough to name their components and type of relationship, it is also

fundamental to identify their determining factors, such as the ecosystems': innovative power; strategy, infrastructure and talent, that co-evolve under an interdependent relationship (ibid). The authors refer to the innovation ecosystem as something wider than science parks, science cities, technopolises, or innovation clusters, arguing that nowadays the term "ecosystem" refers to a more systematic, digitalised and open system, in which producers and consumers are equally responsible for the ecosystem's evolution. Indeed, which forces determine the development of an innovation ecosystem, is an issue that fuels an interesting debate: scholars try to answer the science-based instinct of conceiving ecosystems as a "natural and self aware entity", addressing the difference between the "natural" and "artificial" evolution of an ecosystem. Concerning this point, Adner 2006 argues that innovation ecosystems in particular, can be defined as "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution". In this framework, Granstrand and Holgersson (2020), put together the "system" concept, that is to say, transforming inputs into outputs thanks to the networking of interacting actors, with the concept of "innovation", stating that innovation ecosystems introduce in the economy something new from already-existing inputs, with a degree of "newness" depending from the change and usefulness that it brings. The author analyses the "ecologic" feature of innovation "eco"systems and, after comparing 120 publications, offers a new definition based on the most common elements in the literature, empirical examples, and natural science: "an innovation ecosystem is the evolving set of actors, activities, and artefacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors", in which "importance" and "innovative performance" are dependent to the context, " not necessarily at the cost of imprecision" (ibid). The definition, as many of the analysed ones, leads back to the studies of J.F. Moore (1993), who sees innovation ecosystems as a small universe in which actors collaborate and at the same time compete. Those ecosystems are seen as a living creature that undergoes a "life cycle": birth, expansion, leadership, and self-renewal or death: each phase has its own features and challenges, allowing the ecosystem to evolve from an unstable collection of elements to a structured network (ibid). Oh et Al. (2016) argue that the analogy between "artificial" and "natural" forces that

characterise ecosystems can be misleading, as innovation ecosystems are man-made constructs, intentionally designed and governed on the contrary to natural ecosystems, which are a self-evolving entity. The authors argue that, unlike natural ecosystems which can only be local, innovation ecosystems have indeed the potential to be larger (ibid).

From the literature analysis, innovation ecosystems can be defined as a network of actors (students, workers, researchers and others) that through institutionalised economic and non-economic entities (universities, companies, research institutions, public institutions, venture capitalists, funding agencies, and others), form an interconnected structure, focused on innovation, that may compete with similar structures (Granstrand, Holgersson 2020; Kurshan, 2022; Jackson, 2011; Oh et al. 2016, Mercan and Göktaş, 2011). The ecosystem enables outputs that would have not been achieved without those connections, characterised by both competition and collaboration (Adner, 2006; Oh et al. 2016). Furthermore, according to Jackson (2011) the ecosystems evolve following a "Virtuous cycle" for which resource expenditures in Research and Development (R&D) are paid off by greater earnings in the commercial economy (Moore, 1996).

To study the formation of an innovation ecosystem, several scholars referred to the "knowledge spillover" theories, analysing the relationship between entrepreneurship and the spillovers from educational and business institutions in the area (Giudici et al. 2017; Cojoianu et al. 2020; Audretsch and Belitski, 2021; Lattacher et al., 2021). Knowledge, indeed, can be considered at the heart of innovation, which develops thanks to academia and Research and Development (R&D) organisations and institutions. In general, shared information and production factors (K, L) are named by scholars "market externalities": they represent the actions originating from one activity that can influence and help the development of neighbouring firms, but are not immediately reflected in market pricing (Lattacher et al. 2021).

## 2.4.2 Ecosystems and Innovation Ecosystems: Specialisation externalities

The main contributions in this theoretical framework refer to the "specialisation externalities", for which industries specialise geographically, as proximity encourages the transmission of knowledge within industries; lowers the cost of transporting inputs and outputs; and enables businesses to take advantage of a more skilled labour market (Marshall, 1890). This theory represents the theoretical roots from which Marshall (1890), Arrow (1962), and Romer (1986) built the concept of intra-industries "specialisation" or "localisation" externalities, also referred to by acronym "MAR" (externalities) for which the spatial concentration of a certain industry facilitates knowledge spillovers between firms, fostering growth and innovation in a given region (Beaudry, Schiffauerova, 2008). Firms in fact, just like institutions and organisations, cannot internalise all their processes and knowledge, which can indeed "spill over" from their domain: this is why, according to "MAR" theories, it is important for firms to agglomerate in a given region, where to accumulate knowledge and exploit externalities (ibid). On this, Romer (1986) explains how growth comes from endogenous factors, namely information externalities from both intentional or tacit communication (ibid.), whose effects can affect businesses competitiveness and innovation dynamics, as well as its security (Audretsch et al., 2021). Additionally, Porter contends that knowledge spillovers mostly take place within vertically integrated industries (same sector, different layer of production), supporting the Marshallian specialisation hypothesis assessing the identification of intra-industry spillovers as primary cause for knowledge spillovers (Beaudry, Schiffauerova, 2008). Localisation externalities and the relative knowledge spillovers also allow economies of scale, as sharing the costs of production factors, structures and infrastructures can benefit firms working in the same sector (Krugman, 1991). A close debate leads back to competition externalities Porter (1990), to which competition more than sectoral specialisation and monopoly promotes knowledge spillover, as it accelerates the "urge" for innovation (Audretsch et al., 2021). Famous examples of localised economies based on knowledge spillover are the Silicon Valley

for hi-tech, the technology park "Sophia Antipolis" in south of France or the Taiwan hi-tech (namely, semiconductor) manufacturing production hub.

### **2.4.3. Ecosystems and Innovation Ecosystems: Urbanisation externalities**

While localisation externalities' literature mentions the benefits of spatial concentration and intra-industries knowledge spillovers, Jacobs' (1969) and related theories defend a more "dispersive" and "diversity-based" approach (Henderson et al., 1995). Along with Jacobs, the main source of growth and innovation for industries lies in the external environment in which an industry locates (Neffke et al. 2008). Namely, it's argued that the more diverse an environment is, the greater is the number of services and resources from which firms (and, more broadly, industries) can benefit from. (ibid). "Urbanisation" or "diversification" externalities are indeed based on the assumption that diversification and competition between agents are key for innovation and growth, as a diverse industrial network facilitates imitation and competition processes, facilitating Research and Development. across complementary industries (Beaudry, Schiffauerova, 2008, p.2.). Diverse approaches have been used in the literature to address the diversity issue. According to Henderson, Kuncoro, and Turner (1995), a diversified environment promotes the growth of high-technology business in particular, as they need high-quality talent and many different skills to design prototypes and market them (ibid.)

Henderson et al. (1995), referring to Jacobs' dynamic externalities, suggests that new high-tech firms tend to develop in large diversified metropolitan areas, with a rich and dense talent market, while mature industries eventually move to smaller but highly-specialised areas, with lower production factors' costs. Furthermore, the authors argue that knowledge spillovers and externalities are particularly powerful in small contexts, in which communication has less barriers and is thus more sectorial and direct (ibid.). Indeed, the field of new economic geography (NEG) has thoroughly examined the influence of spatial concentration on the

location choice of economic activities, arguing that entrepreneurial activity is not uniformly distributed across geographical regions, but rather exhibits a propensity for clustering in specific areas. According to Jacobs in fact, the arena for innovation are large cities and not specialised hubs, as large urban contexts allow richer knowledge and workforce exchanges between many diverse industries, maximising sectoral assets(Beaudry, Schiffauerova, 2008).

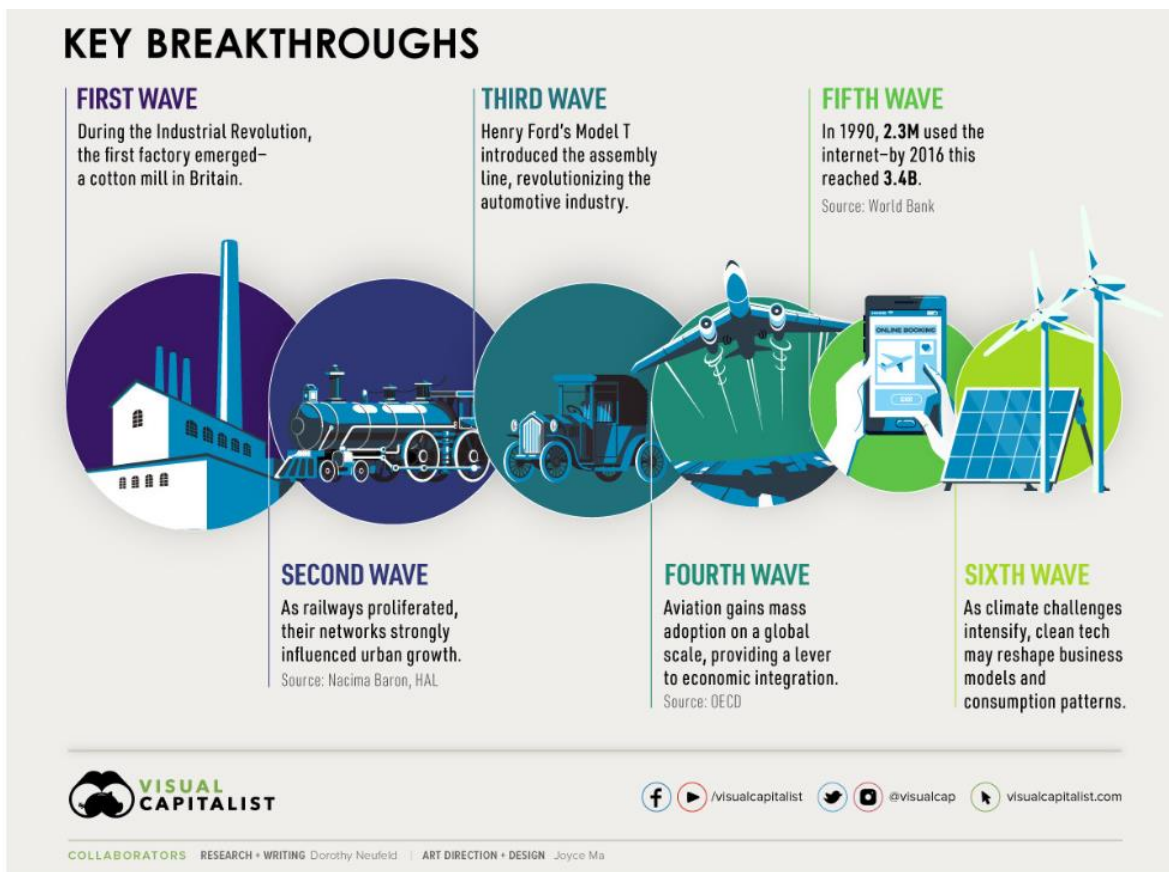
#### **2.4.4 Main drivers and dynamics in Innovation Ecosystems' evolution**

Being a systemic process, innovation and its success directly depend from the context they develop in (Adner, Kapoor, 2010): thus, in order to have an innovation ecosystem, there is the need to have not only the "innovators", that is to say the offer, but also the demand for that type of output, as well as a regulatory framework that fosters such processes (Adner, 2006). Williamson (1996) focuses indeed on governance, claiming that local institutions and authorities have the strong potential to promote innovation for local businesses, by facilitating the transmission of knowledge and putting in light local comparative advantages. Such theory roots back to the comparative advantages theory of Ricardo, to which one country specialises in the production of a certain good as it has comparative advantages with respect to a competitor, who will in turn have competitive advantages in another sector, generated from a better use of given and previously deployed resources (Cinquetti, 2018). To these regards, Williamson, puts together the institutional environment with the institutions of governance, showing that generic forms of market organisation (market, hybrid and hierarchical) vary depending on the nature of the contract laws adopted, mainly in terms of property rights, productions and distribution laws, security hazards and bureaucracy. Furthermore, Henderson et al. (1995), claim that for mature industries there are high levels of persistence in employment patterns.

### 2.4.5 Ecosystems and innovation cycles

In addition, Schumpeter, one of the early pioneers in the study of entrepreneurship, distinguished between "inventions" and "innovations", arguing that entrepreneurs play a fundamental role in the deployment of inventions, introducing new complex views and methods of production and highlighting that those "innovation mechanisms" require a similar level of skill and bravery as the act of inventing a product (Besnouda, Benali, 2021). Innovation and the power of entrepreneurs are indeed central in the Schumpeterian theories, for which innovation in its development implies a process called "creative accumulation", for which multiple organisational routines are repeated and accumulated over time, capitalising on prior experiences and learning (J.A. Schumpeter, "Capitalism, Socialism and Democracy," Harper, New York, 1942). Nonetheless, innovations become mainstream, technologies and productive methods go through a "creative destruction" period, in which obsolete methods and technologies are dismantled, paving the way to new approaches and inventions: while many firms disappear, others are born, and others grow stronger (ibid). In such times, innovation is boosted and relatively dispersed: as it is not strictly related to a specific type of deployment, strategies are more focused on exploration rather than exploitation (Archibugi et al. 2013). In fact, Audretsch and Feldman (1996) argue that for businesses that rely on innovation, the decision to locate in a specific area is driven more by the potential for knowledge spillovers than by the concentration of production in that area. Hence, innovations are not introduced in the same amount throughout time, but are concentrated in certain periods - which are thus characterised by strong expansion - followed by recessions, during which the economy returns to the circular flow equilibrium. However, this balance is not the same as the previous one, but is modified by innovation. This means that those "disruptive" innovations cause long waves of economic development, driven by a specific technology that originated in different countries before spreading globally (Wonglimpiyarat, 2005).

Fig. 1: Schumpeter's Innovation Cycles



The history of innovation cycles. Image: Visual Capitalist

The history of innovation cycles. Image: Visual Capitalist, retrieved from WBCSD, 2021

This swing between creative disruption, normalisation and collapse of innovations is addressed by the author as "economic long wave". With this theory, Schumpeter explains the underlying force that propels the Kondratiev "long cycle theory", in which there are recurring patterns of prosperity and recession, with periods of growth followed by periods of decline, that last between 20 and 40 years (ibid). Looking at the present, current Literature argues that, following those theories, we are now living the sixth Kondratiev wave, characterised by Artificial Intelligence, Information Technology and Cleantech development. Still, several authors argue that short-wave cycles instead, that is to say shorter recession and expansion periods, are more



concrete and less controversial, as forecasting short elastic "crisis-growth" economic movements is more realistic than assuming 40-years long waves (WBCSD, 2021).

## **2.5 Green Innovation Ecosystems**

### **2.5.1 Conditions and challenges are reshaping the features of innovation ecosystems**

Regardless of the theory one may adopt, the World Business Council For Sustainable Development (WBCSD), underlines how the following years may follow another path. Unpredictable changes can reshape the future, mostly when taking into account public health, sustainability, autocratic drifts and geopolitical tensions (Roland Berger, 2020; WBCSD, 2020). In fact, the expectations for the year 2008 to be the start of an innovation and prosperity period, were turned off by a strong economic stagnation, and turned off by the 2020 Covid-19 pandemic (Roland Berger, 2020). In the uncertainty of future developments, between several macroeconomic theories and trends reports, it emerges that the only inescapable trends are overpopulation and global warming (Mackenzie, 2020). Only by answering to those issues through health policies, peacekeeping and green innovation can sustainable economic growth be relatively predictable and realistic (Roland Berger, 2020). This calls for a new meaning of "growth", for which prosperity needs to be attained through different paradigms with respect to the past, when growth meant a linear "take,make,dispose" resource-intensive economy. This will be possible not just thanks to a more circular and less intensive production methods, but also through social movements that can bring important changes, as the "Fridays For Future" movement is showing (WBCSD, 2020). Namely, Bensouda and Benali (2021) suggest how the Covid-19 outbreak accelerated the need for innovation, both in terms of digitalisation and sustainability, calling for energy efficiency as top priority.

Furthermore, Barrios and Barrios (2004) emphasised the anachronistic nature of linear production theories, as many local development leaders questioned the effectiveness of an incremental expansion of local economies through business agglomerations. Those doubts met other claims, raised by local leaders and sustainability advocates, calling for policies that shift from short-sighted innovation approaches to sustainable innovation strategies, aimed at bringing prosperity while protecting natural resources and local communities. (ibid). The regulatory framework backing green innovation is an issue addressed also by Kapsalyamova et al. (2014), who argue that what drives cleantech are the business conditions affecting the operational costs, as well as the intellectual property rights and cluster protection in a given context, more than simply market factors. Green startups in fact have to face greater challenges, as they have to fit in a linear capitalistic economy, minding profits and products marketability, while making a positive impact on the environment and society (Speckemeier and Tsivrikos, 2022). Namely, green startups often stand out for being knowledge intensive businesses, for which they need skilled human capital and, often, high technological capital (Zhilkina et al. 2020). Employees, furthermore, aren't just asked to show business or innovation skills, but it's often expected from them a degree of sustainable development knowledge, sharing the ideology behind the firm (Speckemeier and Tsivrikos, 2022). Because of those factors green startups often have high-entry barriers in the market, and demand external funding for high seed capital (ibid).

In fact, the great challenge of green startups is that despite developing into a capitalistic linear market, they are trying to change its paradigms: for this reason they naturally compete against incumbent corporations and firms, which are well oiled and well connected with established regulatory institutions and, typically, more powerful (ibid.) Namely, the particular nature of green startups, characterised by a value-driven approach more than a purely economic one, calls for further studies on green innovation entrepreneurship (green IEs) and on the factors that allow green startups to grow and integrate in, or modify, current economies.

Thus, looking at green innovation entrepreneurship, it is important to mind the factors that foster or hamper its development.

## 2.5.2 The green Innovation Scene

The legal and financial framework above-described, shows how European institutions are working to pave the way towards net zero through the activation of several incentives. Some of them, like Horizon Europe, specifically target ESG innovation and development, addressing green research and innovation (R&I). Vedula et al. (2021) highlight how many environmental issues are being addressed indeed by innovation, and in particular through green entrepreneurship. In fact, Zhilkina et al (2020) revealed the extent to which investors are financing green innovation and namely green startups, under the phenomenon of the so-called “environmentalisation of the economy”. According to EU-startups, the main online magazine on startups in Europe, the relevance that sustainability and in general ESG are getting, is pushing actors to massively invest in green startups, as they are believed to tackle a "myriad of solutions to help different functions within our society with being more sustainable" (Pun, 2022). In fact "Dealroom", the European software that tracks European startups funding, shows that European startups focusing on sustainability raised 11 billions Euros in 2021, compared to the 4,7 billion Euros in 2020 (King, 2022). Dealoom also underlines how the need to meet both climate political targets -such as the 55% decrease in GHG- and consumers' claims for sustainability, is pushing large corporations to seek for green alternatives, as well as for new assessment tools (ibid). Over the last five years, Europe saw a yearly increase for up to 57% in sustainable startups investment, and addressed over half of newly issued venture capital to ESG-driven businesses (Perrone, 2021). Eu-Startups furthermore reveals that 2022 has been a record year in terms of investments for sustainable startups, highlighting nordic regions as leaders in "green venture capital" issuing (Allen, 2022).

According to "Net-Zero insights", the world's largest database on startups and innovation, within climate tech; the third quarter of 2022, saw the majority of investment going towards ventures in the energy transition sector, followed by transport, circular economy, and food tech (Netzeroinights.com, 2022). In particular, sectors like renewable energy and energy-recycling

solutions saw an increase in the last months (summer of 2022), reflecting the Ukrainian war shortages (World Economic Forum, 2022). In fact, according to EU Startups, as green innovations are reshaping economic sectors, auditing systems and services will increase lockstep, in order to guide public and private actors in coping with the net-zero transition and consequent legal framework (Pun, 2022). Thus, the current framework and data show how green entrepreneurship is assuming an increasingly relevant role in fuelling the European green transition and energy transformation. To that reason, Dealroom and the business growth and destination agency for London "London & Partners" analysed the European context of green startups and compared it to the global green innovation scenario: it emerged that Europe is at the forefront of green innovation growth, outperforming both China and the U.S.A. (Delaroom.co, 2021). In this framework, it is indeed of interest to look at how and why those processes of green innovation growth occur, referring to the concept of "green innovation ecosystems". The study of green innovation dynamics presents unique challenges, as they differ from those associated with non-green innovation. Factors such as societal and environmental impact, as well as adherence to sustainable development goals, are integral considerations in the development and success of green innovation. These nuances necessitate a specialised approach in understanding and analysing the processes and outcomes associated with green innovation.

### **2.5.3 Main features of Green Innovation Ecosystems**

With recent scientific and daily-life evidence on climate change, green entrepreneurship is often considered the force needed to reshape current economic models and transition to a greener society. Cojoianu et al. (2021, p.5) highlight indeed how in the last decades governments have failed to implement environmental protection services, allowing the charge for a green transition to fall into SME's hands, with the emergence of the concept of green "impact investing". Green innovation ecosystems in fact rose as an important topic of study during recent years, as developing green solutions has become a major target for both firms

and governments. Cojoianu et al. (2021) indeed put in light the positive effect and efficiency that green entrepreneurship has on the environment where it develops, showing how in cities that host a large number of green startups pollution decreased by approximately PM 2.5 in 9 years. Much of the study on green entrepreneurship focuses on the formation and components of green innovation ecosystems (IEs), building up on former agglomeration and knowledge spillover theories, from Marshallian forces, to the New Economic Geography (Speckemeier, Oksanen et al. 2015; Giudici et al., 2021; Yi, 2021, Zhikina et al.,2020). Namely, the main components of such an ecosystem are often found to be startups, research and educational institutions, incumbent firms, local organisations, and local governments (Cojoianu et al., 2020, 2021; Speckemeier and Tsivirikos, 2022; Marcon et al. 2021). When analysed in depth, current IEs show that the development of green startups through knowledge spillover is strongly related to the given sector (Giudici et al. 2017). Green startups are often described as "hi-tech and knowledge intensive" firms, as cleantech ultimately became attractive in green open-innovation processes for incumbent firms (ibid.). For this reason, green IEs aren't evenly spread in the global economy, which presents some "hotspots", where green entrepreneurship is effervescent and others where there are more barriers (Marcon et al. 2021).

## **2.5.4 Green Innovation Ecoystsems' dynamics**

### **2.5.4.1 The iInfluence of Metropolitan Areas on Green Startups**

In this context, contrary to the agglomeration theories, Hofer and Potter (2010 ) refer to the Polanyi's embeddedness theory, for which startups, helped by the outsourcing power of digital technologies, are often funded in the city where the entrepreneur lives, as there he can find a familiar environment with easy access to resources, avoiding the rising gentrification and cost-of-life in metropolitan areas. Many scholars, still, prove that green startups are funded and developed in large metropolitan areas, as cities are often characterised with a higher business

culture, funding opportunities and skilled human capital (Speckemeier and Tsivrikos, 2022; Marcon et al. 2021; Corradini, 2019). Namely, Speckemeier and Tsivrikos, (2022) supporting Giudici et al. (2017), demonstrate how green startups choose their location depending on the number of both incumbent firms and of other startups in a given region. In fact, current literature almost unanimously flags the benefits of a dense, dynamic and knowledge intensive environment, from which green startups exploit both technical knowledge and facilities (Speckemeier and Tsivrikos, 2022; Giudici et al. Marcon, Takalo, 2021). Namely, the studies of Speckemeier and Tsivrikos (2022) found a positive relationship between the number of green startups and the number of educated talent and number of patents in a region. Furthermore, it is also claimed that mainly knowledge-intensive startups are the ones that favour large urban centres, as they can benefit from a high stock of technological knowledge and funding opportunities: in those contexts indeed, it seems more likely for a "green business culture" to emerge (Mayer, Motoyama, 2020, Huang et al.). Those theories support the Jacobs' urbanisation externalities theory, for which rich and diverse environment promotes knowledge spillover and ultimately fosters innovation (Beaudry, Schiffauerova, 2008).

#### 2.5.4.2 The role of universities and research centers in Innovative Entrepreneurship

Namely, Giudici et al. (2017) in their research on green entrepreneurship in Italy found that the number of green firms is positively related not just to universities or R&D centres, but also to the environmental awareness of local governments. In fact, climate policy plans supporting green entrepreneurship appear fundamental in order to adjust market failures linked to the non-monetisation of nature (European Forest Institute, 2022). Furthermore, the free and public feature of natural assets implies that consumers are not willing to pay for environmentally-focused services, as they receive only part of their benefits, and mostly in an indirect way (Giudici et al. 2017). This means that green firms can face below-average return on investment (ROI) and thus investments, a process which often stops businesses from growing. All those

arguments underline how the need for public and private venture capital is rooted in the distinctive nature of green startups (ibid). Local governments' climate awareness is indeed important for the development of green startups, not only because of economic policies, but also for the educational and influential power institutions can have on citizens (Eckert and Kovalevska, 2021). In her thesis on EU Regions concerning "What Shapes 'Smart' Regional Innovation Ecosystems", the author Vlada Kuznetsova underlines several times how digitalization processes not only helped in facilitating exchanges and coworking processes, but also increased the quantity and quality of innovation generation (Kuznetsova, V., 2021). Indeed, scholars underline the positive relationship between IoT startups and technical universities or R&D centres, as their knowledge and talent is absorbed by entrepreneurs that use them for innovation, offering business opportunities to students. (Conojau et al. ANNO; Henderson et al. (1995); Giudici et al. 2017).

In this frame, it is worth citing the OECD's working paper on Public Research and Innovative Entrepreneurship, which analyses the extent to which universities and Research Centres contribute to innovative entrepreneurship (2019). Delving into those processes, the study compares academic and non-academic startups, in order to assess the influence of public research in their creation and evolution, underlining how it is still unclear for policy makers which levers to trigger for fostering innovation (ibid., p.7). Through an analysis conducted on 20 OECD and BRICS countries, entailing startups created after the year 2001, the paper reveals that academic startups appear more successful than non-academic startups, in terms of likelihood to obtain fundings, to scale-up and the amount of fundings received, with students introducing in the market the most innovative solutions compared to researchers (ibid., p. 6, 15). Namely, academic startups seem to have advantages over non-academic ones due to the potential for knowledge spillovers from their academic network and the skills of their founders (ibid., 29). It emerges indeed that knowledge spillovers decrease with distance, leading to the hypothesis that academic startups are more likely to be funded in proximity to academic institutions than non-academic startups, as they benefit from the so-called "functional area" of their alma mater university. However, this could also be explained by the fact that start-ups

that do not have strong ties with academic centres may have more flexibility and autonomy to move (ibid., 33).

#### 2.5.4.3. Complementary elements and regulations enhancing sustainable Innovation

An eco-friendly environment appears crucial to deliver marketable sustainable solutions, which is a process indeed fostered by those actors that do not directly produce sustainable innovation, but are complementary to its impact and implementation (Marcon et al. 2021, p.593 ). Namely, consultancies and experts, as well as organisations or "complementors" were proven to increase awareness on sustainability issues and laws, adding value to sustainable goods and services and fostering their diffusion (Fagerberg, 2018). Speckemier et Tsivrikos, 2022 suggest that green startups have a high demand for advanced technologies, financing, and talent, and that the possibility that sustainable businesses will cluster is higher in areas with a close-knit network of academic institutions and industry professionals. Namely, they verified that these dynamics exist in the sustainable IT industry, for which the top-three performing countries are found to be Germany, United Kingdom and France (ibid). As Urbanisation externalities theories prove (Adner, 2006), having a demand for innovations (in this case, for green solutions) is pivotal for (green) startups to emerge, find funding and have an average or above-average return on investment. In fact, green innovations are often hard to market because of their less-than-average return on investment: in this case, local, national and international institutions can positively influence the market, generating market demand for sustainable services through regulations and laws (Marcon et al.; Speckemeier and Tsivrikos (2022); Bendig et al. 2022). Such importance of the regulatory framework in fostering green innovation emerged also in the Conojau et al. studies, who underline how for a real impact on environmental issues, stringent environmental regulations have to be flanked by an effective promotion of green entrepreneurship and knowledge spillovers (Conojau et al. 2020).



Innovation and its success are dependent on the context in which it develops, which includes the availability of knowledge and resources, demand for innovation, and a supportive regulatory framework. Green entrepreneurship is seen as a way to address climate change and transition to a more sustainable society, with SMEs and more specifically impact-focused startups playing a significant role. The European institutions are working towards net zero through several measures and financial programs, which target ESG innovation and development. In the face of current events, green entrepreneurship and innovation dynamics are gathering an increasing importance among policymakers and scholars. Furthermore, there is a growing trend of investors financing green startups, reflecting the so-called “environmentalisation” of the economy.

## Chapter 3: Methodology

### 3.1 Research background:

The European ecosystem framework described above shows how rich and complex the panorama of green innovation in Europe is. In the last years Startups gathered momentum to the point of being considered an important sparkle to fuel that green transition that the EU is pursuing. Being such an important change-maker, green startups are the main unit of analysis of this study, as of the relevant impact they can have on the European decarbonisation journey. The European Commission has indeed addressed research and innovation as one of the main pillars for reaching that "net zero economy" mentioned by its president Von der Leyen,

disclosing several packages of funds and grants. In order to promote a transition towards more sustainable business models and resource efficiency, the Commission also issued important regulations that push corporations to look for green solutions and evolve their business. In this picture, the mechanisms that drive green innovation assume great importance, underlining the need for further studies.

After reviewing scientific publications on innovation and green innovation ecosystems and analysing green startups articles and websites, several gaps on the current European green innovation processes emerged.

### **3.1.1 Contribution to current literature:**

Namely, in spite of the great potential for systemic change held by green entrepreneurship, transversal studies on green cross-sectoral innovation often limit their approach on a single country or region. Furthermore, when investigating the extent to which one or more factors support the development of green entrepreneurship, research on green innovation often has a quantitative approach. Therefore, those types of analysis tend to assess the existence of contributing elements for the foundation and growth of green startups, but not to deepen their meaning, focusing on the context's localisation or diversification externalities without addressing founders' histories and subjective motivations. Furthermore, current studies seem not to investigate the extent to which European funds in particular are contributing to bottom-up green innovation, as it's often complicated to look at each startup's internal funding dynamics or to gather those data from institutions. Moreover, many studies often lack a comprehensive understanding of the relationship between green startups and educational or legal institutions, limiting themselves to a descriptive analysis that confirms that such a relationship exists.

Despite the relatively small sample, performing an in-depth analysis on a large scope allows transferable data to emerge. Indeed, by screening green innovation processes across different contexts, it is possible to detect the main features promoting green entrepreneurship, distinguishing between the dynamics that are closely tied with the socio-cultural environment of a given context and those that instead can be replicated elsewhere. This entails both a descriptive and prescriptive approach and allows useful policy-oriented data to emerge.

The purpose of this study is indeed to offer a thorough examination of the dynamics of green innovation in Europe and how they unfold under the EU Green Deal overarching framework, aiming at providing explanatory findings that answer the qualitative limits in current literature. It is important to mention, nevertheless, that such an in-depth approach combined with the timeframe in which the study was carried out, limits the size of the sample and thus the consistency of the findings.

## **3.2 Sample selection**

To expand upon the current literature on green entrepreneurship on an European level, part of this analysis provides a data-driven mapping which highlights hotspots of green entrepreneurship in Europe. To this aim, several rankings displaying the best performing green startups, on both European and Global level, were analysed, tracking the citation-frequency of the different European countries.

Then, drawing on such results, interviews were performed, to qualitatively assess the main dynamics that support green innovation in those contexts and the relationship of the relative green startups with European innovation funds.

### **3.2.1 Sample selection for quantitative research**

More than 150 rankings were reviewed, analysing the accountability of the source (blogs were excluded) and the period of time in which the ranking was published (not before 2019). The decision to exclude rankings published before 2019 is due to the fast-paced and rapidly evolving nature of the green and sustainable technology sector, with many advancements in digital processes taking place. By limiting the analysis to rankings published after 2019, the study aims at providing insights that are up-to-date and relevant to the current market trends and developments in the field of green and sustainable startups. The eligibility criteria for rankings focused on the internationality of the content, so lists that presented startups based on a regional approach were disregarded. Furthermore, lists focusing on a specific niche or branch within an industry, e.g. "best EU water technology startups", were not considered. The rankings that were analysed are those that are broad in scope, such as "Meet the Europe's 'Green Deal' startup heroes" (Sifted.eu, 2020), or those that target a major sector in which green innovation is prevalent according to current literature such as "Top 10 sustainable tech startups of 2021" (Startups Magazine, 2021). Following those criteria, 29 web-rankings were kept in the analysis.

The rankings were found thanks to web research, using keywords such as: "Best green startups in Europe"; "Best European green startups"; "Best Sustainable development startups in Europe"; "Best startups sustainable innovation/ESG"; "European green startup ranking"; "Best green startups" and "Europe sustainable innovation ranking", which gave results based on the impact of such startups on the European scene, displaying titles such as: "Meet Europe's "Green Deal" startup heroes (Sifted.eu, 2020). The selection of English as the language of choice for the research may result in a bias towards UK-focused results, with respect to those that may appear using other European languages. This influence on the Search Engine Optimization operations, potentially impacts the outcomes of the research. Namely, the limitations concerning the studies are further examined in the "Limitation" chapter (3.5).

The transversal approach of the study implies a wide sample, entailing all 27 European member states. Namely, the selected rankings' content was then analysed in order to ensure the consistency of the data: namely the activities' location (must be: Europe) was verified.

Specifically, startups were selected taking into account their period of activity (not over 5 years), adhering to the World Bank's definition of a startup (Laure & Duchatelet, 2023). Furthermore, the typology of startups was analysed in particular, startups had to contribute to one or more of the EU taxonomy objectives: green startup rankings listing one or more non-green startups (for example, addressing hi-tech, or R&D not focusing on sustainability) weren't considered.

For clarity and readability purposes, in the graphs provided only the countries mentioned in the rankings analysed have been considered. Namely, rankings have been consulted in a given period of time: thus, the data presented in the charts refer to the moment in which the information was accessed by the author, as indicated in the charts' reference table (Annex. 1).

### **3.2.2 Sample selection for qualitative research and participants**

Drawing on the first tertile emerged in the qualitative analysis, the following list of participants displays the startups interviewed in each country in a descending order. The sample was selected according to the specified research criteria (not over 5 years from the foundation; ESG-addressed startup). Namely, each startup was found through web research, entailing the reviewed rankings. Interviewees were selected based on their role within the startups, namely: Chief Executive Officers, Chief Operating Officers, or Business and sustainability accountants. All interviews were recorded and transcribed by the author, under formal consent from the interviewees, which were contacted by email or LinkedIn Chat messages. Consent forms for the publication of a Startup's name were sent and signed: for those who didn't, the data are covered by anonymity.

#### **3.2.2.1 List of the startups interviewed, market sector and respective countries:**

1. Startup A.: energy storage for energy efficiency, Germany.

2. GridX: digital infrastructure for the energy transition, Germany.
3. Tado°: sustainable and smart home climatisation devices, Germany.
4. Startup B.: alternative protein industry using precision fermentation to produce animal fats through microbial metabolism, Sweden
5. SMENA: 2D nanostructured material with unique sensing and catalytic properties for hydrogen production, Sweden.
6. Ecolytiq: software as a service calculating personal CO2 footprint from payment transactions, United Kingdom.
7. Emitwise: software as a service for supply chains' CO2 footprint mapping and management, United Kingdom.
8. Biophilica: plastic-free, compostable leather alternative from green waste, United Kingdom.
9. Immofix: buildings' sustainable renovation services, France.
10. Backacia: marketplace and cabinet for the reuse of building and real estate components, France.
11. MosaMeat: lab-cultivated fats that naturally grow into beef, Netherlands.
12. Humbee: sustainable food network platform, The Netherlands.
13. Startup C.: traceable Recycled Products and Circularity Services to Companies, Norway.
14. Sustie: software as a Service for sustainable online shopping, Norway.
15. Hey!Planet: insect-based food production, Denmark.
16. NordicSolar: semiconductor manufacturing for the renewable energy sector, Denmark.

### 3.2.2.2 Norway and United Kingdom's relevance within the European scope of study

In the context of this study, the data obtained from Norway and the UK was deemed to be significant, as these nations are closely linked to European dynamics in terms of both society

and economy, and possess the potential to exert a significant impact on the objectives of the European Green Deal. Furthermore, the geographical, economical and cultural proximity of these two countries to Europe, allows the information drawn from their actors to serve as valuable models for the implementation of best practices in terms of sustainable innovation for European member states.

## **3.4 Data analysis**

### **3.4.1 Data analysis for quantitative data**

The use of multiple rankings reduces the impact of any potential bias present in a single ranking or a small number of rankings, given that the quality and reliability of each of those may vary based on the presence of an official organisation or methodology.

The number of citations a country receives serves as a proxy for its impact and visibility in the realm of green entrepreneurship, reflecting its innovative potential and ability to bring new solutions to the market. This metric measures the extent to which a country is recognized and referenced in the context of green startups, providing insight on its level of contribution and influence. Eventual citations of the same startup in several rankings were not calculated as an error, but rather as confirmation of the positive performance of a given context in terms of green innovation. Being startups a business entity that is not yet firmly embedded in incumbent industries, it is important to focus on factors such as their performance, impact and perspectives. Namely, a context may be dynamic in terms of startup creation, but it is not certain that these will be successful in the following years and thus be categorised by experts as "promising". For such reasons relevance was given to rankings that feature the most interesting green startups on the European scene, focusing on how successful a country is in such a field (Table n.1).

To analyse and build valuable results on such quantitative data coming from different sources, a cross-sectoral and multi-perspective bibliometric approach was adopted. Such an approach uses the number of times a country is cited as a measure of its impact or importance in the field, in this case, of green innovation. This type of analysis is used to determine the relative importance of a given entity in a specific field or sector, and to identify trends and patterns. The pattern that arose from this analysis was then transposed in a table displaying the number of times a certain country was cited in each ranking (Table n.2). Namely, each row in the table displays: the website, the date the website was accessed and the number of times the country in a given column was cited in that ranking. Building on those data, a descending bar chart was generated, in order to show which countries presented the most active and best performing green entrepreneurial scene (Graph 1). From such data, an European green innovation map was created (Graph 2), visually displaying the degree of "best performant green startups" spatial concentration through a range of gradients, from the darkest (highest number of citation) to the lightest (lowest number of citations). The metric is based on the recognition and reference of a country in the context of green startups, providing an insight into its level of contribution and influence in this area. This research focuses on green innovation and its relationship with the European Green Deal, looking both on the impact of European funds for innovation on green startups, and the impact of green startups on the Green Deal's decarbonisation aims. This leads the research to go beyond the eventual presence of green startups within a context, giving prominence to the conditions in which they develop.

As the ultimate goal of this work is to provide insights on green entrepreneurship that can be useful to foster such dynamics across the Union, it's important to inspect the environments that allow not only the birth, but the development of impact-focused startups: from the design of an innovation, to its market viability and positive impact on the environment. Whether startups are being created or not, the important element to this study is the presence of fostering factors for their development.



### 3.4.2 Data analysis for qualitative data

Thereafter, building on agglomeration and knowledge spillover theories, qualitative research was carried out. Namely, at least two startups from the graph's seven leading countries were interviewed. The seven-countries-sample, that is to say, the first tertile of the descending bar chart, is seen to be a valuable data partitioning, as it embeds the most cited countries in the rankings, which are assumed to represent an interesting sample for a qualitative analytical analysis. For such reasons, the startups undergoing the semi-structured interviews were selected from the rankings themselves: namely, 85 startups were contacted, with a result of 16 answers (response rate of 20%). The duration of each interview ranged between 20 and 30 minutes, still, their transcription varies depending on the level of detail shared by the participants.

In particular, the questions asked were:

- 1. Which are the motivations and factors behind the birth of \*Startup\*?**
- 2. Which role do you feel startups like yours have in the framework of the European Green Deal?**
- 3. Which relationship do you have with the funds that the EU is disclosing for green innovation?**
- 4. Do you feel part of a "green-innovation cluster" or do you see it blooming?**

The topics are outlined in Table n. 1:

Question	Research Objective
1. Which are the motivations and factors behind the birth of *Startup*?	Understand the motivations that actors have for engaging in sustainability, facing the double challenge of managing a firm that needs to have a positive impact.
2. Which role do you feel that startups like yours have in the framework of the European Green Deal?	Investigate the perceived responsibility interviewees have regarding their role within the European journey towards net zero.
3. Which relationship do you have with the funds that the EU is disclosing for green innovation?	Understand the impact of the European Institutions' funds on green innovation, and namely on small entities like green startups.
4. Do you feel part of a "green-innovation cluster" or do you see it blooming?	Understand the location choice of green startups founders, assessing the existence and eventual leveraging of regional assets.

Table 1: topics covered during the conducted interviews , source: Author's own compilation

The exploratory nature of this research is due to the relatively recent increase in number and relevance of green startups. Semi-structured interviews were shown to provide potentially meaningful information, within the limits of the study. Those types of conversation lead to an in-depth investigation, while allowing the interviewer to keep the interview within the parameters outlined by the objective of the study (Berg, 2007).

The analysis of the data obtained followed a "thematic analysis": a technique which helps identify and understand patterns in qualitative data, to make sense of the information collected and relate it to the research question (Braun and Clarke, 2006). This method involves looking for information that appears repeatedly and is relevant to the topic being studied. The identified patterns were first analysed and then discussed, referring to the research question, to then draw

conclusions and suggestions. The semi-structured nature of the questions was designed in order to "collect data on themes where the interviewer is reasonably certain that the relevant issue has been identified, while yet giving users the option to raise additional concerns that are significant to them through open-ended questions." (Wilson, 2014).

Namely, the thematic analysis is carried on in accordance with the "15-point checklist of criteria for good thematic analysis" outlined by Braun and Clarke (2006).

**Namely:**

- **Familiarising with the data:** This stage involves transcribing interviews and delving into the data by reading collected notes or listening to recordings: it allows the researcher to become familiar with the data and make initial observations.
- **Coding:** This stage involves generating labels (lexical descriptors) through a back-and-forth process analysing the main points emerged from the conversations. Such an approach allows for both the semantic and conceptual understanding of the obtained information.
- **Searching for themes:** Themes are meaningful patterns in data constructed by connecting and relating codes to the research question and inherent sub-research objectives leading the interviews. Themes are thus determined by the research question and codes identified.
- **Reviewing themes:** Checking themes' relevance to specific data extracts and the entire dataset through an iterative and reflective process. This can be achieved by combining, discarding and splitting themes as necessary.
- **Defining and naming themes:** Examining each theme, to identify the overall findings emerging from the obtained information and capturing the essence of each theme by giving it a concise and informative title.

- **Writing up:** Writing is an integral part of the analysis process, beginning in phase one and continuing throughout. It involves linking relevant data and themes, comparing and contrasting them with the literature framework initially provided and the research question.

To improve the transparency and clarity of qualitative research. The Standards for Reporting Qualitative Research (SRQR) from the Journal of the Association of American Medical Colleges were also used while analysing findings. (O'Brien et al., 2014).

Finally, conclusions were drawn in order to answer the main research question: "What are the factors that drive green innovation in European startups and how do EU funding systems for innovation impact the development of these startups in the identified green innovation hotspots?", opening a discussion on the future European perspectives on green innovation.

The time spectrum for this inductive analysis ranges from June 2022 to January 2023.

### 3.5 Limitations

The vast sample, the tools used and the amount of time in which the research was carried on, don't allow to perform a high number of in-depth interviews per context, limiting the insights that could be gathered under such a scope. In fact, only between two and three startups per country were interviewed, resulting in a non-optimal representation of a country's green innovation mechanisms. The main reason behind such a sample is twofold: targeted startups are facing their most intense years of growth, thus CEOs, COOs and other relevant accounting staff were often unavailable for a 20-30 minutes interviews. Indeed, the majority of the startups contacted, after a first contact, did not take part in the interviews. Another limitation of the study concerns the rankings analysed, which, being a domain of the given website, can be temporary and/or periodically refreshed. Namely, the data provided in the graphs generated by rankings refer to the period between June 2022 and January 2023. Performing semi-structured interviews means that the participant, as mentioned, can elaborate his personal opinion within

the limits posed by the author. Still, this may imply subjective views, especially when tackling issues like fundraising processes and relationships with the European Union.

Furthermore, as mentioned above, the use of English as the language of investigation may result in a propensity towards results with a UK-centric perspective, with respect to those that might crop up through the use of alternative European languages. Also, web results may vary in correspondence to the geographical location in which the author is working, slightly influencing the results. Besides, web search results are inherently influenced by other elements, including the SEO strategies employed by websites, their listing methodology and network and the utilisation of keywords.

Despite these challenges, the rankings used in this investigation originate from globally recognized sources within the business industry, which were also used in the realm of the author's activities within European Projects. In fact, their popularity (e.g. the Sifted Magazine from the Financial Times), their search engine ranking, their backlinks and level of interaction with social media and users underline their reliability. In this picture, the multiplicity of the sources analysed bolsters the authenticity of the results.

### **3.6 A macroscopic approach and the importance of transferability**

Despite the limited sample size, a comprehensive analysis across a broad scope can reveal valuable insights with transferable applications. More precisely, a macroscopic analysis allows to capture drivers common to various contexts, without delving into context-specific dynamics. In fact, engaging in in-depth analysis of local specificities and uniqueness within a small sample often produces results that are purely descriptive and do not favour the transferability and thus the application of such information in substantially different contexts. Without overshadowing local specificities, when addressing international policies it's important to have a macroscopic approach for innovation dynamics: this allows the fostering factors that are not

strictly dependent on the historical, geographical or cultural roots of a specific context, to emerge and be shared internationally.

## **Chapter 4: Presentation of the research content**

This study tackles the main characteristics of green innovation throughout Europe, backing a qualitative analysis with preliminary quantitative data. After a first mapping of the green innovation ecosystems in Europe, a qualitative approach is adopted, in order to assess the fostering factors behind green startups development. To these regards, current literature outlines the main elements that prompt the development of green innovation: suppliers, universities, research institutes and technological firms, as well as regulation and governmental agencies, seem to play a crucial role. Such dynamics bring to light the importance of open innovation for both incumbent firms and green startups (Lee, 2007). As it will be illustrated in this chapter, those issues emerged through the work of the author in an Horizon 2020 project, during which uneven green-innovation-intensive areas were spotted.

### **4.1 Problem and issues at heart**

The research question this work focuses on originated while the author was working with a sustainability-focused consultancy firm for the European Commission's project "Net Zero Cities" (Net Zero Cities, 2023), in the year 2022. The project, started in 2021 with a four-year duration, consists in connecting a network of one hundred European cities providing practical tools and guidelines that support the collective cooperation towards the sustainable development of urban spaces, with the aim of reaching urban climate neutrality by 2030. To attain those objectives, the 33 project-partners are building a digital network platform, which

will enable city halls and urban planners to directly collaborate with "practitioners", that is to say, experts from different sectors able to propose and implement sustainable solutions in the city area. The project entails academics, experts, urban planners and majors, and is financed by the Horizon Europe funding program holding a budget of 53 Million Euros (ibid).

In order to implement sustainable solutions in urban areas, the project was looking for experts able to propose meaningful, circular and adaptable innovations for several thematic areas. These categories were designed by project members to comprehensively address present needs of involved cities, as well as to build new paradigms for circular urban and suburban development. Namely, such categories encompass: Digital solutions; Stationary energy; Nature-based solutions; Energy generation; Mobility and transport; Green industry and Circular economy.

Within this context, the author was charged to find Europe-based incubators, and accelerators in order to scout startups that focused on sustainable innovation, in order to build a network of innovators for each thematic area. While performing such a screening, a pattern of green innovation clusters in Europe emerged. Namely, relapsing countries were found while analysing green startups' performance rankings or European accelerators' portfolios, leading to the hypothesis of the presence of some factors able to foster green innovation. Although the results of such research are reserved, the heterogeneity of the patterns observed represented an interesting object of study.

The picture emerged though the scanning in fact, led to the formulation of the core-issues of this research, **namely:**

- **Which are the most important factors for the emergence and development of green startups?**
- **Are those entities a fundamental actor for the achievement of a net-zero economy?**
- **If yes, are they sufficiently supported by the European Institutions?**

Those questions lead to the necessity to provide both qualitative and quantitative answers to such a complex issue.

## 4.2 Reasons behind the European focus

As described above, European countries are often ranked among the best performing countries for green innovation. The 2021 UN ranking on SDG performance displays twenty eight European states in the top thirty positions (Sachs et al. 2021) while the World Economic Forum ranked 14 European Countries in the top-20 positions for investing in sustainable development (Masterson, 2022). Also, the European Union developed a "eco-innovation" index, which is meant to measure the environmental innovations by 16 indicators on inputs, activities, outputs, socio economic outcomes and resources efficiency indicators. Those data are used to form a tool called "European Eco Innovation Scoreboard Interactive Tool " which provides a score for the amount of eco-innovation released by each country (European Commission, 2022). By the outlook the table displays, it emerges that the countries with the highest eco-innovation scores are located in the central/northern European regions, in countries such as: Austria, Denmark, Sweden, Germany or the Netherlands.

The Bower Collective, a popular sustainable goods company, developed and released a tool that assesses and compares the green innovation performance of European countries. The tool evaluates various metrics, such as the number of green startups, green technology patents, and investments in sustainable businesses, and aligns with the United Nations' Sustainable Development Goals (SDGs). The purpose of this tool is to evaluate and recognize the contributions of European innovators and leaders in the field of green innovation (Europe's Green Innovation Index, 2022). From the results provided by such a tool, Germany emerged as the top performer in the composite index of green innovation, ranking first in four out of six factors analysed. The country indeed presents the most dense network of green startups (364) and the highest rate of green patents released. Sweden is ranked second in the index,



characterised by the highest investment in green funding and a steady growth in investment over the past five years (ibid). The Netherlands and France also performed well, rounding out the top three positions performing equally well (ibid.).

Those data show how strong is the growth of green innovation in Europe is (Allen, 2022) and how their development is following particular and irregular dynamics.

### 4.3 Summary

The research issues arose during the work for the Net Zero Cities project, when the author observed an uneven distribution of green startups within the Union. Since the European Union should have a "levelling" role and invest in green innovation, as it's strongly defended in their publications, this study has the aim to assess the impact of those policies through an in-depth analysis of green startups' growth dynamics.

To that aim, after a mapping screening the green entrepreneurial scene in the Union, semi-structured interviews were then conducted, in order to provide a meaningful understanding of the uneven dynamics behind the creation and management of green innovation, as well as the entrepreneurs' perception of the European Net-Zero journey.

No data obtained during the realm of the European Commission's Net Zero Cities project are shared within this research.

## Chapter 5: Findings

This research revolves around the following interests: green innovation; innovation ecosystems and the European Green Deal's funding system impact, specifically on green startups within the targeted area. The process of research started with familiarising with the European green startups' ecosystem to then delve into its features and dynamics. The following section displays the findings of the study, resulting from the analysis of both quantitative and qualitative data. The first part analyses the findings relative to the distribution of green startups in Europe, attempting to inspect the contributions of current literature on green innovation hotspots. The second part focuses on a qualitative analysis of such a mapping, investigating why and how startups develop in the given contexts, as well as their relationship with European R&I Funds. The analysis of data in this study suggests that the development of green innovation in Europe is primarily driven by factors such as the sustainable consciousness of founders, the identification of market gaps for sustainable products, and the presence of an innovation-conducive environment. It appears that financial stimuli from top-down measures do not play a significant role in driving green innovation. However, the legal framework supporting a green transition has been found to be a crucial aspect as it facilitates the adoption of green innovation by incumbent firms and other actors. Namely, it is noted that the measures related to the European Green Deal do not appear to actively support bottom-up green entrepreneurship.

## **5.1 European Green Innovation hotspots mapping**

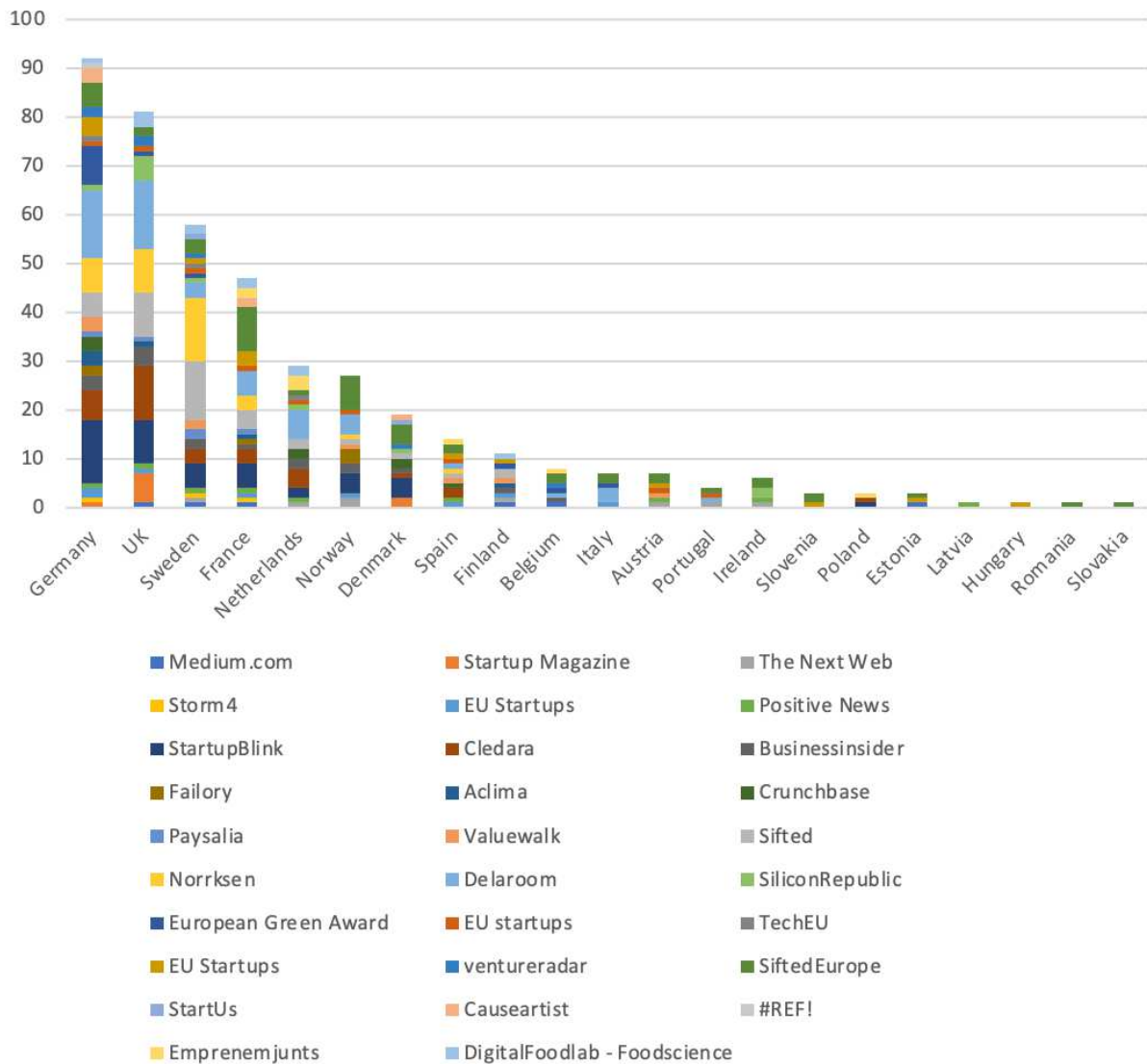
As cited above, the following section displays the findings obtained through the screening of 29 web-rankings entailing green innovation. Namely, the rankings focused on the performance of green startups, displaying the best-performing actors according to several criteria. This approach considers several rankings of the same subject but built through different metrics and obtains general results. Such a multi-perspective bibliometric analysis indeed looks at the subject from multiple viewpoints and dimensions, in order to provide a more comprehensive understanding of the subject.

The collected data show how Germany holds a clear advantage in terms of green innovation, as evidenced by the high number of citations in the analysed "best green startups" rankings. Germany is then followed by the United Kingdom, Sweden and France, which also demonstrate strong performance in this area. Such findings suggest that these countries have developed a robust ecosystem for green innovation, and are at the forefront of driving sustainable advancement in Europe, providing both products and services for a greener economy.

The following countries in the ranking, namely Netherlands, Norway and Denmark, also seem to host a high number of well-performing green startups, with respectively 29, 27 and 19 cumulated rankings' citations. Those scores underline how vibrant and dynamic the ecosystem of startup is in these particular European regions, which seem to present a fertile ground for green innovation. The study's emphasis lies on the absolute count of green startups, rather than the relative count adjusted for the population size in a specific state. This choice depends on the idea that it is not important the green startups' density per se, but a context's ability to support green innovation. The relative importance in these terms of a pondered estimate, can be seen in the high number of Best Green Startups in countries with very different population densities, e.g. Germany and Sweden, with 83.2 million and 10.4 million inhabitants respectively.

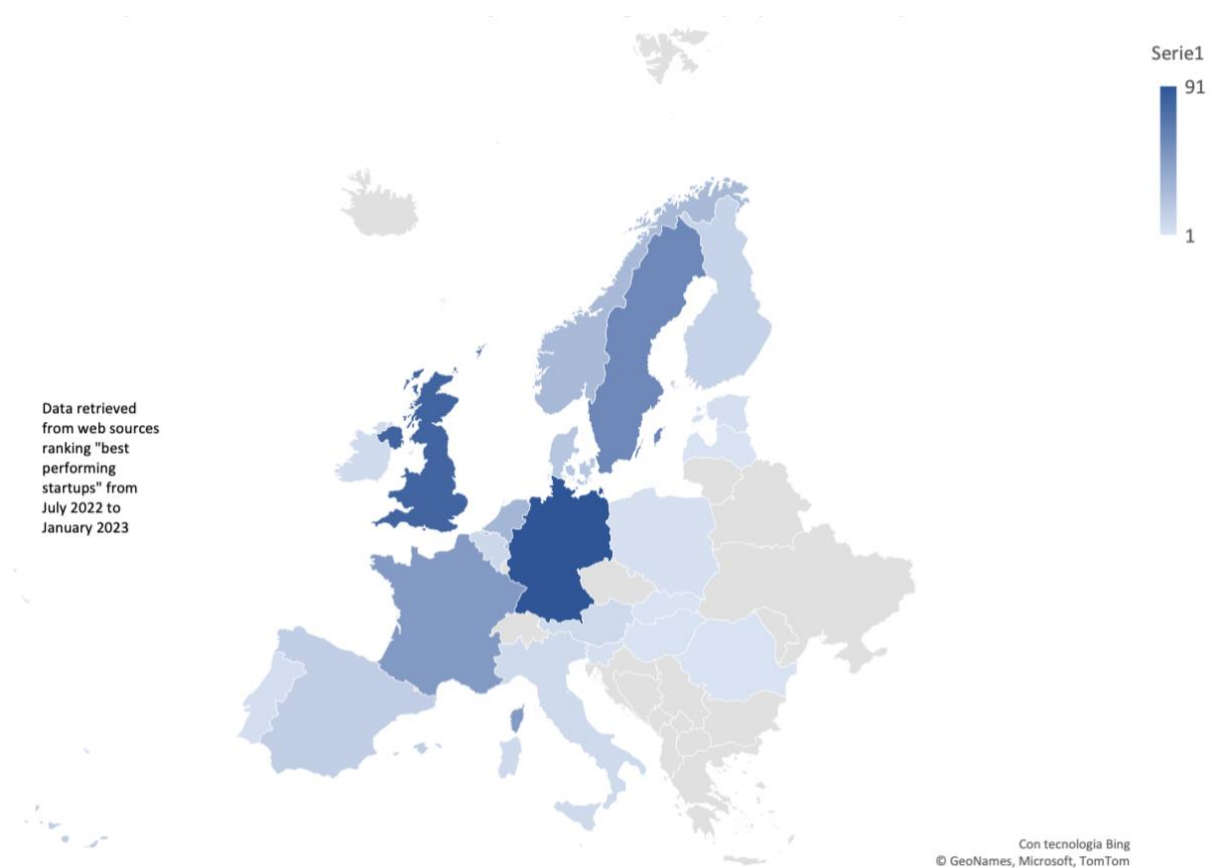
For readability and calculation purposes, the European countries never mentioned in the rankings were excluded from the table and, thus, from the charts.

## Most Cited European Countries in Top Green Startup Rankings



TAB. N.2: MOST CITED EUROPEAN COUNTRIES IN BEST PERFORMING GREEN STARTUPS' RANKINGS SOURCE: AUTHOR, 2023

In fact, from the map produced using the total number of citations for each country it is possible to assess that green innovation hotspots in Europe tend to concentrate in the central/northern region of the Union.



TAB. 3, EUROPEAN CONCENTRATION OF BEST-PERFORMING STARTUPS, SOURCE: AUTHOR.

By analysing such data from an analytical perspective, it is interesting to see that the highest concentration of well-performing sustainability-focused startups can be found in countries with a very strong industrial heritage both in terms of production facilities and industrial infrastructures, as well as an high rate of manufacturing output, such as Germany, the UK and France (West, 2018). Still, such a simplistic deduction does not explain why smaller countries with notoriously smaller industrial networks, at least on a local level, are able to have such a high performance in terms of green innovation.

After considering such a mapping, it is essential to evaluate the underlying factors that contribute to the observed disparities in green innovation performance among European countries. In order to gain a comprehensive understanding of the dynamics driving these outcomes, between two and three startups per country have been interviewed, targeting the first tertile of the graph. For this reason, semi-structured interviews were carried out, delving into several research objectives. An analytical and comparative examination of the bibliometric data represented in the rankings was carried out through the collection and analysis of qualitative data obtained from interviews with actors directly involved in green innovation, such as entrepreneurs running green startups or other relevant figures within the company. This approach allows for a deeper understanding and interpretation of the bibliometric data, providing valuable insights into the dynamics driving green innovation in Europe.

## **5.2 Motivations and drivers behind green startups' development**

The purpose of this chapter is to present a thorough review of the data that was gathered during the semi-structured interviews with the chosen study participants after going through the research stages that were outlined in the previous chapter. The study questions were addressed by the conclusions from the data collected, which are now provided in the form of pertinent quotes from the interviews and succinct descriptions of the themes that emerged. Each of the startups' actors involved in the research gave explicit consent for publishing findings obtained through their interviews.

The themes that emerged from the interviews are aimed at displaying the main factors that characterise the current best green innovation contexts of Europe. The first part of the semi-structured interviews aims to understand the motivations that push entrepreneurs to start a sustainability-focused company. Greenwashing refers to the practice of making false or misleading claims about the green features of a product or service (Dictionary.Cambridge.org).

This can include exaggerating the environmental benefits of a product or service, or making claims that are not substantiated by scientific evidence (ibid.). To avoid greenwashing accusations, entrepreneurs should ensure that their sustainability practices are consistent and based on shared and verified scientific evidence (Aarstad, Jakobsen, 2020). As a consequence, green startups' entrepreneurs face the additional challenge of carbon accounting and emissions' transparency, which leads them to provide clear and accurate information to their customers and investors (ibid). It appears therefore paramount to understand the motivations that actors have when choosing to develop a business with a twofold focus: profit and sustainability.

**The following section thus displays both a series of factors that were found fostering green innovation throughout the different countries (5.2.1), as well as the description of the relationships between green innovators and the European scene of sustainable innovation (5.3), namely focusing on the impact of European Green Deal's funding programs. Further on, some needs expressed by the participants are displayed, revealing the most important measures to implement to improve green innovation in the Union.**

### **5.2.1 Sensitivity to global warming**

**Common to most of the selected actors is a strong environmental sensitivity, in general due to the perceived severity of global warming's effects.** Indeed, it appears that one of the most important underlying forces pushing for green innovation is the concern for the future, which has prompted students, researchers or entrepreneurs to take action to fight climate change in practical terms.

*"The vision from which we were born was to actually act for the climate, engaging by doing something related to our field of studies, but always for the sustainable development of the planet." Startup B., 1*

*"Before starting the company, me and these friends we were all living together and we really wanted to do something about it, we used to talk about the different solutions to overcome climate change." Emitwise, 1*

*"I had my daughter in 2013, coupled with watching and discussing a lot of news. You really start to think about the future and on how scary it is." Biophilica, 1*

**It also emerged that such climate change awareness often arose during education years, in which the participants had the chance to acknowledge climate-related issues and develop an interest towards them.**

*"It may sound cheesy but me and my co-founders we were very sensitive to climate change from an early age, we had a good education in which there was this really good science teacher that explained us the mechanisms of global warming." Emitwise, 1*

*"I studied business administration and economics, but we had the opportunity, at my University, to spend 25% of the time doing a very different subject that we could choose, independently from business administration. So I decided to do sustainability studies. I totally loved my studies as they had economics, business and also sustainability". Ecoltiq, 1*

## **5.2.2 Market Gaps**

**Another important motivation for the birth and development of green innovation is the detection of market gaps, or unmet needs in the current marketplace, from entrepreneurs.** Interviewees indeed highlight how the climate crisis has brought to light a



multitude of challenges and demands to which new technologies, products, and services can answer, providing economic opportunities for innovators.

*"There was a gap in the market, like parts of a puzzle that for which many actors have a part of the solution, but they were not connected in a network that brought those solutions around easily." Humbee, 1*

*"Specifically, we want to close the taste and price gap between alternative meat and dairy products and traditional meat and dairy. There is a big unmet need for better fats to be used in these products and we have a technology platform that can solve this." Startup B., 1*

*"[...] we thought there was this big gap around helping companies find profitable ways to decarbonize." Emitwise, 1*

### **5.2.3 Market demand**

**Furthermore, data reveal that sustainable innovation is able to develop because the two stimulating forces, that is to say, climate sensitivity and market opportunities, meet an increasing demand for sustainable products in a given economy.** The reasons for such an increase in the demand seems to depend on the sensitivity to climate change of the population in the given context.

*"[...] the interest for food has never been bigger, greater than it is now. [...] More money has been put in because investors know that it serves a purpose. Ten years ago, nobody wanted to even consider buying a plant instead of meat." Hey!Planet, 1*

*"In Sweden in general the sustainability aspect is not a “plus” anymore, is fundamental: if you don't approach sustainability with your invention (especially hi-tech) you are not even marketable [...].” SMENA,1*

"Consumers are now willing to go for greener choices and expect greener alternatives also from incumbent large companies. [...] Sustie, 2

**Moreover, the concern for sustainable solutions was found to surge in the wake of exceptional events such as COVID-19 or the Ukraine war.**

*"The market is waiting for this, the demand is there and is really high. The awareness of the war helped Europe and the energy field to invest in renewable technologies, for the planet and also for being self-sufficient, which for us was the only good thing of this war." Startup A., 1*

*"The reuse of materials became more and more popular, most of all after COVID-19. After that there has been a general recognition on the importance of sustainability, that businesses and people have an important impact on the environment in which we live. The pandemics made a sort of an echo in the spirits of people for which they realised that there are issues on which pay attention and the reuse of resources and limitation of pollution is part of that." Backacia, 1*

#### **5.2.4 Purchasing power and economy's responsiveness to changes**

**Together with the climate sensitivity of consumers, the demand for green solutions was found to be positively related with the adaptability and reactivity of a given economy to structural changes and the purchasing power of the population.**

*"More money has been put in because investors know that it serves a purpose [...]. We are talking to big companies like IKEA, and others that are looking into the possibility of taking in this product, and we are doing it now, which is interesting, because they [clients like IKEA, edit.] are approaching our product now like it was for plant-based food 10 years ago." Hey!Planet, 1*

*"However, sometimes this change requires some investments, an industry that has thin margins. So, restaurants face financial hesitation in prioritising sustainability. [...] So there can be the people that are innovating that say: "hey! There is what you were looking for!", and the person that has to change will be like: "yes but it costs money to switch, I have other expenses and other priorities at the moment". [...] This is not just about making a fancy presentation for the European commission, this is about putting food on people's table, often they really don't have the money for those changes". Humbee, 2*

*"I think people are sensitive to climate change because here in Norway the general population has a higher average standard of living. In other countries the gap between rich and poor is huge [...] Prices are still high for new sustainable products like Patagonia. I think that the interest for suitable products comes both from high education and income. And also having economies able to adapt to these new things faster. But other poorer countries will follow, it will just take longer." ; "There are a lot of businesses trying to change something. This goes along with education and people trying to look for more sustainable alternatives [...]" Sustie 1; 2*

*"[...] sustainability switched from "it's good if you approach one of the [UN, edit.] SDGs" to "if you don't approach or try to solve an SDG you are not eligible anymore"; "But in general, the industry appreciates and seeks innovation." ; "Sustainability is something engrained in everyday life, it is generally appreciated that you buy eco-friendly things, people bike, is something broader, in the culture of Sweden." SMENA, 1; 4*

## **5.2.5 Education: technical and business skills**

**In supporting the creation of green startups, data revealed the importance of specialised hubs in technical and business sciences.** Indeed, education plays a pivotal role in the startup stage of green innovations. In such a stage, interviews highlighted the important role of skilled talent, namely, in technical disciplines such as hi-tech, science, and business.

*"The startup was born from the 2 co-founders who met at the University of Aachen" ; "I studied sustainable resource management at TU Munich. And you'll find people from that program and all different types of green innovation companies, whether it be in the startup sector, consulting sector, logistics, it'll come in a lot of different forms. And I think these kinds of master's programs are actually one helpful way to help these types of green companies bloom, I think there's that constant feed of passionate and smart talent." GridX, 1 ; 4*

*"You have not just innovative companies but also the groundwork of universities such as the TU Delft which create people who like to innovate, that's it! So Universities like TU Delft, or TU Eindhoven and Rotterdam Management School, really have innovation and business focused education: you have a bunch of young people growing up and getting educated in an environment which is like: what is the next best idea? This is true especially for technology and engineering." Humbee, 1*

*"[...] it was born from the meeting of the two founders: one was from HEC (Paris Business School) and the other from ESTP (Public structures school): they met for working on a project for reducing the pollutants coming from buildings. There was indeed an ecosystem of entrepreneurs around that." Backacia, 1*

## **5.2.6 Business friendly environment**

**Namely, it appears that in those contexts the very core of green innovation, where sustainable solutions originating often from researchers or students become marketable products or services, are hubs where the academic environment merges with the business world.** Those touchpoints are often fostered by both public and private bodies that collaborate, providing funds and ad-hoc structures for innovation development, creating a startup-friendly environment.

*"The Swedish Ecosystem might seem complex but it's also very nurturing when it comes to commercialise research: there are few incentives trying to promote research going in the industry: they were a part of a cluster of researchers working on 2-D materials, very thin materials, in which researchers try to commercialise their respective researchers, and inventions. [...] The business climate here in the Gothenburg region where I work also is very non-hierarchical, is not hard to scale-up."* SMENA, 1

*"[...] two months ago was in the Impact Fest 2022 in the Hague and it was amazing, it's this giant, massive hub, with innovators, companies, larger companies coming together, consultancies firms, startups, venture capitalists, municipalities, coming to discuss and brainstorm collectively in a broad arena of industries, sharing best practices, what is happening in a city, in another and so on. [...] Even us as Humbee we are trying to hire a chief technical officer, and it's a challenge because and everybody who finishes their programming masters they start creating their own startups to implement innovation. [...] innovation funds are there, the environment in general is focused on innovation: some of them work, some of them don't, but the environment is an incubator itself." ; "These are not just people in the innovation field, they go to COP23, it is very broad. It is also connecting to other hubs, to ideas going on in Africa, USA, Asia and so on. So, it is a hub but it's a connected hub, it is a vibrant, alive hub [...]" Humbee, 1; 4*

*"Sustie was born out of an accelerator called Antler, it's like an international accelerator which brings different people together like founders. Inside Antler, we have something called "industry sprints" for which a corporate company came to us [...] with a problem and we had to solve it in 24 hours, and then we did. Sustie came out of that because this media company "Icarus", an e-commerce company, came to us and presented the sprint. [...] Antler is like a facilitator, they have business partners who come in and pitch different problems, then you join. [...] there's a lot of these accelerators and incubators around Europe too, but to be able to attach it to impact and sustainability...I haven't seen that many investors into that field in southern Europe."* Sustie, 1

*"ReVibe Energy is a spin-out<sup>[1]</sup> from a university entrepreneurship education called Chalmers School of Entrepreneurship together with incubator Chalmers Ventures (called Chalmers*

*Incubator at the time). [...] The automotive SAAB Group contributed with a military technology which the founders of ReVibe commercialized for the civil industry." ReVibe, I*

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### 5.2.7 Specialised talent pools and Urbanisation externalities

**Interestingly, data reveal that while during the start-up stage green startups are often generated in specialised hubs, during the scaling-up stage they tend to move to urban centers (unless it already was the "birthplace"), as in those contexts there is the possibility to benefit from the supporting network for the development of their business.** Namely, the most attractive elements for choosing a location were found to be: investors, Universities (mostly: technical universities), innovation hubs and investors.

*"Originally the startup was born in Toulouse, then we moved to Paris: it is very important to be based in a city because if you don't have a network, you can't really grow fast. The startup moved to Paris indeed to meet banks and investors: without this the startup would have died, I think. In Paris you have a consistent market, with clients that have structural needs, various stakeholders and important industrial actors. Then, in European capitals you can work more closely to institutions, both on the financial and on the legal side." Immofix, I*

*"The two founders met at university in an entrepreneurship class, then they founded a communication-space startup, in 2011, they sold that and then they did conventional jobs. They tasted the blood and then they quit it and founded Tado: Christian is not from Munich but Johannes does: they had different options on where to host the company, one of the main reasons to choose Munich was due to fact that there is a lot of tech talent, the real estate is quite expensive, but people earn also more and certainly there is really strong technological talent available. [...] We have a technological university quite famous here [TUM, mentioned after, edit.], then quality of life is also high: the soft factors align as well, but talent availability is certainly a big factor." Tado, I*

*"Founders are from Munich and first they went to start up area, a nucleus area and used the facilities like coworking spaces for startups. There is a lot of collaboration with other teams, networking, sharing facilities, consistent collaborations and exchanges with universities. Normally teams going there come from Universities, they are there because there are these places and these places are there because there is the need and the willingness to innovate. [...] Some of them are public and some private." ; "There are many conferences and many meetings: there is an efficient approach on raw materials: you can share knowledge, help each other."*  
*Startup A., 1; 4*

**An interesting finding that emerges from this picture brings to light how the digitalisation of services or products management induced the scaling-up stage to be more flexible in space.**

*"So, the startup was born in Aachen and one of the founders is still working from there, the other is in Munich. [...] Then, our technology is cloud-based, so people can move from there if they want to and part of the business team decided to move to Munich because they knew that there is a good talent market there, on both software engineering but also business." GridX, 1*

*"The Foodtech community is quite connected [...] We are connected digitally, but our sector is growing very much [...]. "* Startup B., 4

*"Hey!planet is Copenhagen based, and a lot of things are happening here. It is attracting for many green startups, unless they need some sort of production facility." Hey!Planet, 1*

## **5.2.8 Regulations and funding programs**

**Data reveal that governmental and European fundings and regulations are fundamental for stimulating both the demand and the production of green innovation in a given context.**

*"We monitor changes and actively use the tighter regulations as a positive force for change [...]. "*Startup C., 2

*"In Sweden there is a Law that is called "teachers exemption": if a researcher comes up with something during the time at Chalmers the idea and patent falls on the researchers themselves, not on the university. Without it, a lot of good ideas get stuck in the University without being commercialised, because students don't know how to do it. [...] Another important factor is that there is quite a lot of access to governmental fundings, there are whole bunch of different funds, accelerators, innovation offices even for early stage ventures. [...]" SMENA, 1*

*"CSRD demands that corporates have a good carbon reporting, and they need a good Carbon accounting company, but without the demand it's hard to expect things to change a lot." Emitwise, 2*

*"Then in terms of factors, one of the things that enabled the company from becoming reality is innovation funds. In Netherlands there is funding body MKBIDEE<sup>[1]</sup>, which is a network that gets together all of these innovative ideas: you can apply to it, picture your idea, put it forward and they provide funds. It like a competition, they give different amount of funds. It is an innovation funding network, they are different bodies put together, the government is part of this, and the main idea is to support innovation, a sort of incubator, a multi-sectoral innovation hub. So we got some fundings from there to get off the ground. Then, we raised capital from investors as well, so we got funding from different sources in order to start-up. " Humbee, 1*

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<sup>[1]</sup> "MKB!dee is an initiative of the Dutch ministry of Economic Affairs to promote the development of experimental approaches for (and by) lifelong learning in small and medium sized enterprises. The programme is implemented by the Dutch national STEM platform (PTvT) in cooperation with the Dutch Enterprise Agency (RVO) and provides support and funding (up to 200.000 per project) to SMEs for the development of new approaches". (EuStemCoalition.eu 2023, from <https://www.stemcoalition.eu/programmes/mkbdee>).



### 5.3: Relationships between Green Startups and the European Green Deal

**When interviewees were asked if they felt part of a "green innovation cluster", the majority answered positively. An important aspect worth mentioning when analysing this point, is the digital conception that clusters, and ecosystems more in general, are acquiring.**

*"I actually feel part of a green innovation ecosystem somewhat, a sort of a cluster for green innovation collaboration[...]" Startup C., 4*

*"We feel we are a part of a fast growing industry with a good industry network in Denmark. You may call it a "solar cluster". There is a handful of companies like ours that work together, learn from each other and attract employees to Denmark." Nordic Solar, 4*

*"Yes, in Paris there are all the big corporations working and is easy to say that here there is a sustainability-oriented cluster. Paris is surely part of an ecosystem which is stimulating on those issues but is not alone: Lyon is also one and on the re-use of materials also Brussels is strong. London too. In France again there are other spots that are smaller but that are developing like Nantes and Toulouse." Backacia, 4*

**Still, some of the interviewees stated that they don't feel part of a green innovation ecosystem or cluster specifically. This seems depending on the level of physical interconnection between firms.**

*"Well, I would say yes, even if not precisely geographically, in the sense that it is a global movement. Just this week there was a conference on cultured meat, where one can see the*

*blooming and world-wide expansion of this field. It is a movement of researchers and startup, working together towards a mission. Hotspots for this are in Europe, mainly in the north” MosaMeat, 4*

*“I personally don’t not feel part of a specific green innovation cluster. The Foodtech community is quite connected - but via private organisations – there are no publicly funded initiatives. We are connected digitally, but yes our sector is growing very much but I don’t perceive it under the shape of a cluster.” Startup B., 4*

**Namely, in the broader context of the European Green Deal, entrepreneurs claim having an important role, as they provide concrete green solutions to the overarching Green Deal's aim of creating a net zero economy:**

*"Still, they [policies] provide the context everybody has to operate in, but in the end is rather small companies who disrupt the technical dominant space than is currently dominating the system then established players changing the ways they operate. Like when you look at UK or Germany, they big companies are losing market like crazy, and you have players, new companies who do not have that huge heritage that is lowering them down, that carry on: new companies have much higher degree of freedom, they have different personal they can hire, they do not have that huge structure to disrupt." Tado, 2*

*"I think startups are crucial to drive the growth in the green energy development." Nordic Solar, 2*

*"[...] in the long term, however, the goal is to replace a significant portion of beef in supermarkets with cultivated beef, and at that point the impact will be big. We are able to change the consumption of meat and therefore the habits of people." Mosa Meat, 2*

**Although recognising an important function in concretising the aims of the EU Green Deal, many actors argued that institutions and incumbent firms have a complementary if not primary role in this, by creating the groundwork for those solutions to be adopted:**

*"It's also important to note that large existing corporations play a large part in quickly transforming to conserve our shared resources too." Biophilica, 2*

*"[...]for the goal of the Green Deal (carbon neutral EU until 2050) to come true the impact from startups won't be that significant, it is other and much larger processes that needs to change. Startups for sure have an impact, but they won't make the cut themselves" ReVibe Energy, 2*

*"[...] startups can define the trend, but who is giving the direction, who has the market influence are big corporations: they actually then refer to startups to find innovation, they are side actors but with a main role for bringing innovation in corporations [...] big corporations do CSR, for example one of the main enterprises of France that is a big player in the oil industry is saying that sustainability is a priority but this is totally hypocritical. Often green startups make the cut into the market and then get absorbed by bigger corporations, they can bring innovation to front, but it often depends from the possibilities given by larger firms." Immofix, 2*

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## 5.4 Critiques and needs

**Many participants claim the necessity for further improvement. Indeed, when looking at the broader picture of the European Green Deal, green startups seem to call for concrete support to bottom-up innovation. More precisely, data reveal the necessity to foster and support innovation through the creation of efficient impact-focused policies that stimulate and facilitate the implementation of green solutions in incumbent firms, considering the specificities and potential of each context.**

"[...] we see rather populist type of policies that look good on the surface, that combine this message of change, but are those the most efficient and economic ways to reach climate targets? I am not so sure" ; "There are actors that are engaging in creating a thick network, based on ESG, but those actors experience difficulties in positioning in the market: do they really have an impact? Is policy helping those actors having a real impact over big corporations? I am not seeing it. If it's always money leading the interest of policy and not real impact on resource efficiency and tackling climate change then how can we evolve towards that?" Immofix, 2; 4

*"You need the government to make better rules, to push [...] There are longer processes, if things could change immediately, it would be dangerous for sure, but this means that large corporations and organisations take time to implement changes, they are slow [...] So two things that institutions can do are: A. set those rules, B. make it easier. [...] there is not the understanding of how this is translated on the ground, it is important what the EU does, but you should turn your eyes on the local context to see what is actually been done: the municipal level knows a lot better what the challenges are [...] the implementation happens to the local level, so it should be important to give enough power to the people who understand the unique circumstances that there are in certain location." Humbee, 2*

*"What is really important is the industry support through regulation/industry framework and development of the electricity infrastructure. On top of this financing help within projects is very important." Nordic Solar, 2*

**Namely, public financial support to green innovators was claimed to be helpful in enabling green startups to scale up and influence current systems, mostly when entailing supply chains. To this end, fostering connections between businesses and innovators (e.g. students) was found to be crucial.**

*"[...] it's very difficult to get on the market.[...] if you really want to do something about it, it's political: institutions have to state that this is the way we need to go if we're going to do things differently." Hey!Planet, 1*

*“Companies need to make money and that’s how you help cut carbon. Silicon Valley is a money-making machine and the fact that we had access to investors, advisors and people that built companies in Silicon Valley meant we were able to take our vision to create our sustainability technologies but do it with that sort of foundation. Whereas when we spoke with some of the ecosystems, of the accelerators in the UK and Europe that were more sustainability-focused, it felt a lot more like charity creators and not business creators, they are very focused on the impact but not focused on how you can actually drive profitability.” Emitwise, 4*

*"I think it's obviously in the EU's best interests to provide additional funding for green startups, [...] it fits in the overall ethos of Green Deal's ideals. [...] I think, if you're going into some aspect of digitalization, then perhaps additional EU funding isn't as critical. But if you're trying to be part of the supply chain, then I think it's absolutely necessary. Just from an economies of scale standpoint, and from how cost efficient a lot of these larger producers are, especially coming out of like China, for instance. [...] In general I hope there will be larger fundings." GridX, 3*

**In these regards, several interviewees revealed that a favourable approach to support and stimulate innovation at the same time, would be to bestow public funds to the best performing green startups after examining their empirical impact cases more than focusing on bureaucratic aspects.**

*"for example companies cutting CO2 emissions from individuals or companies: if you can prove that and get in contact with the EU this could be a very nice thing to accelerate, to bring funds to the right companies." Ecolytiq, 3*

*"So, if startups show that something works, they prove to the larger picture that something is actually possible, we show that there is demand for that. That’s one of the roles of startups: to prove that things can work, to do that quickly and to be experimental, finding new pathways" Humbee, 2*

## 5.5 Relationship with European funds

**Data reveal that often small entrepreneurs don't get access to those types of fundings because of the complexity of the procedures needed to apply. Namely, entrepreneurs flag that such procedures can be time-consuming and costly.** This is often because they require the assistance of consultants to navigate the process, which can take a significant amount of time. Several entrepreneurs have reported that they are not aware of funding opportunities available through the European Union. Additionally, it has been acknowledged that the information regarding these opportunities can be difficult to obtain and understand. Therefore, such applications are not undertaken, as the likelihood of success in these cases is perceived as low, and the cost-benefit ratio is seen as unfavorable.

**The vast majority of the interviewees don't benefit from the funds bestowed from the European Union for Innovation.**

*"No we don't use any EU funds." Backacia, 3.*

*"We have never used anything else than private funding raised by ourselves and bank financing sourced by ourselves." Nordic Solar, 3*

*"No we haven't take ant EU money at all" Emitwise, 3*

**Data in fact reveal a sort of bureaucratic threshold between green startups and European Funding mechanism: this gap becomes even deeper when considered the cost and the time needed to comply to all the given requirements.**

*"No we don't. We had a scale-up approach like many others. Startups or SMEs that obtain those European funds are able to get them because they have experts working for them usually. That also is a business: the actors that enable firms to get those important funds from European institutions make money out of those situation: they are also the ones knowing that those funds exist, many non-expert people don't get these information. It is a sort of preferential channel for those who already have contacts with those bodies: why is there never clear and published information on those funds? Why is information always hard to grasp? Then grants are really consistent [...] Getting funds for innovation is not as simple as we would want in order to accelerate a green transition. It is not that if you answer to the criteria you are going to have them: you have to face a set bureaucratic processes that is really huge and may last for years! [...] If they don't get the fund is wasted money, and a startup normally can't afford that, they don't even know if they will make it through the following years sometimes. In the green-tech environment it is actually easier to have funds because the impact of their products can be seen or proved easily and fast." Immofix, 3*

*"No. It takes time to apply for EU funding, it's quite a lot of work. Because sometimes you also need to co-apply for different funds in the European Union, like you have to have a company with you or another partner. Then the grants for European Union can be like 50 million Euros, and you can't do it all by yourself, and maybe you have like 20 or more companies that go together and apply for that. " Sustie, 3*

**A small number participants instead, benefit from EU funds, but mainly to a small extent:**

*"We are also using public money from the EU, like EU Horizon Europe, European Accelerator: they are helping us getting into the market faster.[...] From Eu funds we actually get very little [...] We are receiving funds from the Government too: the European Union is giving many many funds for innovation, but we are living mainly from our investors that I mentioned ("from*

*Germany, the Netherlands, but also US, they are diversified. It's venture capital investors or capital investors mainly"), Startup B., 3*

*"Yes and no: we primarily private funds, then a part of EU funds are used to a smaller extent.  
" Revibe Energy, 3*

**Interestingly, some entrepreneurs revealed that oftentimes coping with the constraints relative to the obtained funds can modify the core features of a startup, underlining how difficult it is to keep integrity during the scaling-up phase.**

*Of course we have investors, we couldn't do business without making money out of it, we have to create real value propositions to banks: there are some banks that are really interested in that environmental focus, in that effect on behavioral change, but there are also other banks that are only looking at business cases, so we have to serve both. Ecolytiq, 1*

*"Humbee is a private company, and all equity is private. We try to grow it organically, me and the founder, as we don't want to forget why we were born for the sake of scaling up and aiming for money. There are many who are just focused on profit and expansion that they forget why they were founded, they "sell" their principles and main guidelines for gaining more funds. [...] When you are beholden to shareholders that don't necessarily share your decisions then you have to follow their rules" Humbee, 3*

*"is not about public funds you throw at founders, if founders have good idea and you create a business-friendly environment, they will find a way, they will find investors and money. If you set up public money pools that then are being assigned to founders is not the best, the state or public institutions are generally not the best investors in terms of deciding what startup to fund and what not, is not efficient. Professional venture capitalist are much better at this, they will put much more diligence in it since it is their job. The public sphere funds the ones that are good at selling themselves as the greenest but not necessarily the best at it." Tado, 3*



# Chapter 6: Discussion on findings

## Introduction

The following section aims to evaluate existing data and findings in order to address the research question at hand, namely: "What are the factors that drive green innovation in European startups and how do EU funding systems for innovation impact the development of these startups in the identified green innovation hotspots?" This is done in order to gain a deeper understanding of the dynamics of green innovation in the European context and provide evidence on the levers to stimulate in order to foster its growth.

The first section entails the findings relative to the green innovation hotspot mapping. The second section encompasses firstly the motivations and factors behind such dynamics and secondly the relationships between green startups and the European Green Deal legal and financial framework.

## 6.1 Green Innovation Hotspots in Europe

### 6.1.1 Central-northern as hotspot areas

Based on the analysis conducted, it has been determined that the central and northern regions of the European Union exhibit a high level of activity in the field of green innovation.

Specifically, Germany, the United Kingdom, and Sweden have demonstrated exceptional performance in this area, as evidenced by their high frequency of citation-counts within a selected ensemble of 29 rankings, for respectively 94, 83 and 59 citation-counts. Additionally, France, The Netherlands, Norway, and Denmark have also been identified as strong players in green innovation, with a high contribution of green innovation per country. Such findings indicate that these regions are thriving in the green innovation sector by actively working towards providing more sustainable products and services.

### **6.1.2 Compatibility between green innovation rankings**

Those results confirm the data provided by the UN SDGs' based green innovation ranking provided by the company "Bower Collective", to which Germany, Sweden, Netherlands, France, Denmark and the UK are at the forefront of green innovation. It is noteworthy indeed that the top-performing countries in such a ranking are consistent with the findings of the current study, with the top five countries listed in both the Bower's ranking and the current study being identical, although the order differs. This discrepancy can be attributed to the different methodologies and timeframes used for the analysis in the two studies. However, despite the different order, the results do not deviate much. In fact, the compatibility between the two results appears significant especially when considering the fact that the two mappings analyse the same issue using different metrics. Specifically, the fact that both results highlight the same five nations under different green innovation perspectives, underlines their lead in such a sector over the other member states.

Furthermore, the green innovation index provided by the present study is corroborated by other sources in the current literature, which again place as the top-three performing countries in sustainable innovation Germany, the United Kingdom and France (Speckemier et Tzivrikos, 2022). Such findings also align with the Climate Bonds Initiative's outlook on Climate Awareness Bonds, which listed France and Germany as the top CAB issuers in Europe (CBI,

2020). Moreover, the data provided in the mapping compares, except for Austria, to the European Eco Innovation Scoreboard (European Commission, G, 2022), in which the best performing countries are Austria, Denmark, Sweden, Germany or the Netherlands. Still, Austria has been mentioned as one of the most innovative European countries in terms of green innovation within the semi-structured interviews (Startup A, 4). Looking at the qualitative insights provided in this study, it is noteworthy that they seem to confirm these areas as strong players in the sustainable innovation field, as it is claimed in several interviews (Sustie, Immofix, Tado, Startup B.).

Those ecosystems can indeed serve as examples for other European regions, in order to foster green innovation on a communitarian level. Analysing their context can indeed contribute to the development of green innovation in different European regions, by providing valuable insights to foster their own sustainable development efforts.

## **6.2 Drivers behind the emergence of Green Startups**

Simply assessing the presence of green startups in a given region does not explain the overall framework of green innovation in Europe. It is important, indeed, to understand the factors and motivations at the root of such a picture. Namely, when looking at the ambitious objective of the European Union to transition to a net-zero economy before 2050, it must be assessed the extent to which such efforts support a fundamental factor for their achievement: green innovation entrepreneurship. This section offers an outlook on the state of the art of green innovation through the findings retrieved from the direct experience of green startups in the previously targeted hotspots. The discussion will address the themes emerged from the interviews, developing a list of findings which will be compared to the previously analysed academic literature.

Thus, to answer the given research question: "What are the factors that drive green innovation in European startups and how do EU funding systems for innovation impact the development of these startups in the identified green innovation hotspots?" research findings are hereby discussed.

The results must take into account the subjectivity of the answers provided in the interviews, as well as the size of the sample analysed. The complexity and extent of the examined subject, as well as the time and tools spent for the research, hamper a statistically-viable measurement of the targeted issues. Therefore, results must be interpreted along with a judicious approach.

That being said, the authenticity and depth of the findings obtained by this research highlights their utility in the understanding of current internal dynamics in the green innovation sector. Given the limitations in terms of time and resources, a deliberate and targeted approach that focuses on a smaller sample size has been chosen in order to gain a comprehensive understanding of the motivations and drivers behind green startups.

## **6.2.2 Climate change awareness**

The current state of climate change is having a significant impact on the lives and career choices of young people, particularly students (Hickman et al., 2021). Data reveal that this has led to an increased willingness among this demographic to actively contribute to addressing the many issues that global warming implies. This is particularly true for young generations, which, as participants claim and show, are the ones most actively offering and demanding green solutions. Data indeed reveal that for several actors such climate-sensitivity emerged during academic years, which stimulated their willingness to create innovation. Such findings reflect the claims provided by the OECD's study on Innovative Entrepreneurship, according to which education has a positive influence in stimulating

cutting-edge innovation (OECD, 2019). Furthermore, several actors underlined a growing concern of local institutions for environmental sustainability, resulting in concrete support to green innovation through funds or initiatives.

The heightened awareness of global warming has been catalysed by extraordinary events. As claimed by Mackenzie (2020), the only steady trends that international markets and namely investors can rely on are overpopulation and global warming, an awareness which is progressively reshaping the markets. Furthermore, data reveal that climate change awareness, and thus the willingness to actively contribute to tackle, increased after exceptional events such as COVID-19 and the Ukraine war, which highlighted the urgency to switch to more sustainable paradigms on both demand and supply sides. Those findings reflect Giudici et al.'s (2017) research on green entrepreneurship in Italy, according to which the number of green firms is positively related not just to universities or R&D centres, but also to the environmental awareness of local governments.

### **6.2.3 Business and Technical Education**

This assumption is true with particular reference to on business, sustainability, technology, and engineering disciplines. Referring to the above-mentioned findings, it is clear how green innovation would not develop without the presence of relative demand driven by a sense of urgency to switch to greener alternatives. Findings from the interviews suggest that education plays an important role not only in shaping the sensitivity of individuals regarding environmental issues but also in providing the right tools to tackle climate-related issues. Those assumptions highlight a positive relationship between educated talent and green entrepreneurship, which reflects Speckemeier and Tsivrikos (2022) results on green

entrepreneurship, according to which the number of green startups in a given region is directly linked to the number of educated individuals in that context.

Education is playing a crucial role in providing the necessary knowledge and skills for individuals to make a meaningful impact. Backing Speckemier et Tsivrikos, (2022) data suggest that green startups have a strong need for technology, funding, and skilled workers, namely in the fields of engineering, technology and business. All mentioned universities in the interviews fall under two categories: technical universities and business universities. This suggests that the educational backgrounds of the individuals involved in these startups plays a significant role, In fact, obtained data indicate that the majority of the startups exhibit characteristics of knowledge-intensive ventures, as they have developed technologically advanced products or services that are informed by specialised knowledge and expertise in areas such as informatics, web development, software engineering, and food engineering. Also, reflecting Giudici et al. (2017) the findings show that green startups are often hi-tech and knowledge intensive due to an increasing interest in cleantech solutions by incumbent firms. Most of the participants indeed underlined how the contextual economy is very dynamic, highlighting a progressive although difficult openness towards green solutions, mainly relative to the purchasing power of the inhabitants. Indeed, several interviewees claimed that the price of sustainable goods is still too high for average or low-income people, highlighting how important support is for markets to transition towards those solutions.

**Those finding prove that:**

- Green startups tend to be knowledge intensive, as they offer highly technological services that are able to override current non-green mechanisms in an appealing way;
- To stimulate the creation of green solutions, it is important to leverage and invest, among others, in business and technical education, as knowledge spillovers coming from those disciplines have a positive impact on the creation of green startups.

- In order to stimulate both supply and demand for green innovation, institutions and media must raise awareness on climate change, sensitising the population.

Through an in-depth analysis of the data obtained, it is clear how the creation of green startups in those contexts is more a consequence of knowledge spillover dynamics than an active choice of external actors that seek a vibrant hub where to found a green firm. This highlights the importance of a common joint effort from policymakers, universities and institutes in investing in innovation-focused education and incorporating education on environmental sustainability in educational programs.

## **6.2.4 Knowledge-intensive contexts and large urban centres.**

### **6.2.4.1 Green startups seem to cluster around knowledge-intensive hubs.**

As innovation is a systemic process, its success is directly impacted by the context in which it arises (Adner & Kapoor, 2010). Indeed, backing the OECD's studies on Public Research and Innovative Entrepreneurship, interviews reveal that green entrepreneurs funded their activity in highly-specialised hubs, proving that the likelihood of sustainable businesses congregating is greater in regions with a well-connected network of educational establishments and industry experts, namely in the fields of engineering business and technology. Such institutions in fact provide both theoretical, but most importantly practical skills that enable students to ideate and develop an enterprise. In the analysed contexts, data provide evidence for the Schumpeterian process of "creative accumulation", for which knowledge and expertise in a given sector are updated, repeated and accumulated over time, allowing for knowledge spillovers in the area (Besnouda & Benali, 2021). In fact, from the analysed sample, it emerges that being knowledge-intensive startups, green startups seem to favour specialised urban centres, as they can benefit from a high stock of technical knowledge. Indeed, from analysing the sectors

covered by the analysed startups, a nuanced pattern that backs current literature on green innovation emerges, for which the main sectors of interest for green entrepreneurs are: web services for decarbonisation; resources efficiency (e.g. energy storage) and food systems.

#### 6.2.4.2 Localisation choices during the startup or scale-up phase

During the startup stage green startups multiply in specialised knowledge intensive contextes, regardless of their size and internal diversity. Data in fact show how during the start-up stage entrepreneurs are often working in technical or business-specialised academic hubs, whether they are located in a small, medium or large city. In the "birth stage", cities ranging from Achim (32,379 inhab.), to Toulouse (493 465 inhab.), to Munich (1,487,708 inhab.), to London (8,799,800 inhab. - Wikipedia, 2023) were cited, highlighting the little relevance of the location's size, in spite of the knowledge-spillover of a given settlement. Such results contradict the findings proposed by (Mayer, Motoyama, 2020, Huang et al.), according to which knowledge intensive entrepreneurship favours large cities in order to benefit from a wide and diverse range of talent. Those dynamics prove how the location choice in the startup phase is more of a direct consequence of the context's influence on the development of the skills acquired during the education years, rather than a self-determined selection. During the scale-up stage green startups tend to favour larger urban centres, focusing on funding and talent acquisition opportunities. Instead, when looking at the scale-up stage, innovators claimed to be more attracted by larger urban centres, where they could benefit from the presence of investors, networking facilities, institutions and businesses, corroborating several author's theories for which green startups tend to develop in large metropolitan areas, as cities are often characterised with a higher business culture, funding opportunities and skilled human capital (Speckemeier and Tsivrikos, 2022; Marcon et al. 2021; Corradini, 2019).



### 6.2.4.3 Sector's and digitalisation's influence on location choices

The location choice for green startup seems to depend on the sector the entrepreneur work in, as well as on the extent to which they rely on digital processes. In this picture, it is worth mentioning that such dynamics strongly depend on the sector in which the startup is working, as they might look for specialised contexts to benefit from "MAR" externalities. The extent to which startups rely on local and specialisation externalities versus diversification externalities seems indeed greatly influenced by the digital character of their innovation. Evidence suggests that startups that do not solely rely on digital procedures are more dependent on local and specialisation externalities and derive greater benefit from diversification externalities. A clear example for this are the cases of Immofix and Backacia, which offer services for the construction industry and relocated from smaller contexts to Paris. They indeed benefit from the legal, industrial, and information externalities in the Parisian construction market, characterised by high demand for renovation and a growing emphasis on sustainability, both taking advantage from the opportunity to network with investors and businesses through their participation in the "Station F" accelerator. Another example are the German Tado ad GridX, which both re-settled in Munich benefitting from its tech and green-tech scene. Again, such dynamics are strongly industry-dependent, as in the scale-up phase, innovators can decide to settle in the same location where the startup was born if that context is green-business-friendly and/or they are physically dependent from facilities (e.g. manufacturing), as in the case of Startup A.: born and installed in Munich.

Data show how during the scale up phase, a diverse and stimulated environment ultimately fosters innovation, reflecting Jacobs' urbanisation externalities (Beaudry & Schiffauerova, 2008). Those findings also support Speckemier and Tzivrikos (2022) studies, which claim that those dynamics are particularly true for the knowledge-intensive sector of sustainable IT.

#### 6.2.4.4 Digitalisation and green innovation clusters

The rise of digitalization facilitates green innovation while altering the mechanisms of innovation ecosystems. Interviews indeed show the emergence of a very digital approach to green innovation: although some solutions are physical, digitalisation is reshaping innovation dynamics. In this frame, it is worth noting that participants providing digital services were much more flexible in the scaling-up phase, and could face a redistribution of the startups' human resources. The digital feature of many green services in fact (combined with the absence of a structural and human heritage), de-materialises both the localisation and specialisation externalities, allowing teams to dislocate across one or more regions for work or personal-related reasons. Indeed, data reveal a "clouding" process of green innovation clusters, meaning that a dense network in which knowledge, talent and information are intentionally and unintentionally shared Romer (1986) exists in physical terms (e.g. Munich) but is fastly transposed on a digital dimension. Those findings corroborate current literature on innovation and digitalisation, according to which digitalisation helped in facilitating exchanges in coworking processes but also increased the quantity and quality of innovations (Kuznetsova, 2021). The process of digitization partially undermines the theories of specialisation externalities proposed by (Marshall, 1920), and of intra-industries specialisation externalities (Marshall, 1890; Arrow, 1962; and Romer, 1986) as it enables the digital distribution of services and products, leading to the obsolescence of geographic clustering of green innovators (and other non-green startups), mostly during the scale-up phase.

Thus, the literature on specialisation and localisation externalities holds significant importance during the start-up phase, as it reflects how entrepreneurs leverage local assets and networks. However, the "diversification" feature proper to large urban centres, which holds strong significance in the urbanisation theories, seems to not be central in current start-up dynamics. On the contrary, a diversified network of actors and structures seems beneficial in the scale-up phase, in which several participants seemed to favour larger urban settlements. Still, it is important to remember that those theories refer to an obsolete economy, mainly based on

physical products and services and in which global mobility of factors was not as easy nor as fast as is currently the case.

#### 6.2.4.5 Innovation Hubs as the cribs for sustainable solutions' marketing phase.

After developing a market-viable project, startups have to face the so-called scale-up phase, in which the startup has to progressively penetrate the market. Such a phase was found to be the hardest stage in the development journey of green startups, as founders claimed to have to face the double challenge of looking for funds while placing a new product in the economy. In this stage, the presence of experts and ad-hoc structures for developing business skills was found to be pivotal. Many participants in fact developed a germinal idea in those hubs, benefitting from the business-friendly environment they promote. Namely, accelerators, incubators and, more in general, innovation hubs or co-workings, resulted to be the crib for green innovations, as they allow entrepreneurs to market their solutions, benefitting from knowledge sharing on both vertical and horizontal levels by exchanging with peers and networking with firms and founders: "the environment is an incubator itself" Humbee, 1. Such innovation hubs can be funded both by private or public entities, and normally they entail several funding bodies. In these terms, data reveal that the more those structures hold close ties with the mentioned universities, the higher is the likelihood for academic knowledge to be translated into concrete solutions.

#### 6.2.4.6 Touchpoints between education and the businesses foster green entrepreneurship

Highly-performant regions in green innovation such as Sweden and Norway underlined how prolific those environments have been in their development phase. In such contexts it is possible for innovators to form a team and to challenge their own or their team's projects by answering specific calls from firms. For example, the innovation support offered by the

Swedish "Chalmers University of Technology" was praised to be highly beneficial during the startup phase of two of the participants interviewed. Namely, a law called "teachers exemption", fosters the commercialisation of what has been developed within the University, as the relative patent is a property of the student(s) and not of the university. These processes are furthermore backed by an ad-hoc venture firm: "Four (beneficial) factors would definitely be: the strategic help group, the knowledge environment around Chalmers, the structures for research around the University, the dedicated Capital Venture firm they have, the innovation office. It goes: research, innovation office, Chalmers Ventures. And that's very good, since they make the transition easy". Such environments are particularly important for green entrepreneurship also because they allow innovators, which may have technical skills but lack a strong business culture, to identify market gaps and structure business models to tackle them successfully. Those dynamics are reflected in the current literature, which expresses how a business friendly environment close to education institutions is beneficial for innovation and green entrepreneurship (OECD, 2019; Corradini et al., 2019; Mayer & Motoyama, 2020).

In this picture, networking events are highly beneficial to converge entrepreneurs' and companies' needs. Despite those benefits, some participants flagged the need for further stimulating environments, as coworkings or innovation hubs hosting startups can become a stagnant environment, as actors may network only between peers and not vertically, that is to say, with peers and firms. There is indeed evidence for a strong appreciation of not only ad-hoc structures and staff supporting the marketing phase of green startups, but also of networking events that allow entrepreneurs to meet investors, politicians, firms and corporations on an international level (e.g. the annual Innovation Fest in The Hague). In fact, in the analysed contexts, the majority of the participants expressed enthusiasm for what concerns future development in terms of likelihood to penetrate the market. It was indeed found to exist a progressive opening from investors and incumbent firms to sustainable solutions; a process that contrasts the theories proposed by Speckemeier and Tsivirikos (2022), for which green startups would have an under-average trust by investors. Data reveal in fact that the market is gradually opening to green innovation, namely for resources-efficiency-related services like energy storage or emissions' reduction software. In fact, as claimed by several

academics, (Jackson, 2011; Adner, 2006; Porter 1990; Oh et al. 2016; Moore, 1996) innovation is fostered by both competition and collaboration, for which ecosystems evolve in a virtuous cycle in which the expenditure in research and development are counterbalanced by greater returns on investment that spread in the given economy. Nevertheless, participants claim that they do face difficulties in obtaining funds during both their seed and scale-up stage.

Those findings tie in with previous studies which showed that green startups face greater challenges due to their need to balance profitability and marketability of their products with making a positive impact on the environment and society. (Speckemeier and Tsivirikos, 2022). In this frame, scaling and market penetration phases of impact-driven businesses is crucial for a successful transition, given the necessity of entering and navigating the capitalistic market. Thus, investing both in the bundling of innovation-focused hubs connected with research centres and universities and in the organisation of networking events, fosters the penetration of green innovation in the market.

### **6.3 Relationship between green startups and the current European Green Deal political and economical framework.**

Data reveal that events such as the Covid-19 outbreak, extreme climate disasters and the Ukraine war brought sustainability at the forefront of many political agendas. Nonetheless, participants in the analysed sample flagged the need for an increased engagement in green policies, in order to urgently accelerate the decarbonisation of the economy.

### **6.3.1 Legal measures have the responsibility to prepare the groundwork for green innovation**

Fostering green innovation differs from supporting "mainstream" or non-green innovation, as green solutions have the intrinsic aim of overriding current paradigms. Participants indeed claim that green innovations can bring revolutionary changes in the economy, not just in terms of goods and services, but also in terms of behaviour.

Indeed, as both data and literature reveal, green startups can raise awareness on climate related issues: therefore, they do not just market their utility, but also leverage individual moral choices. From the interviews it emerges that Green startups flourish in those countries with a strong economy and climate change awareness, answering the theories of Giudici et al. (2017) to which green entrepreneurship is found to be positively dependent not only from the presence of universities or R&D centres, but also from the environmental awareness of local governments. All interviewees agree on the fact that green startups are a crucial factor for the realisation of the EU Green Deal's aims, as they literally bring sustainability into shape. Still, many of the participants emphasise that the role of concretising the ambitious goals of the Green Deal is in the hands of institutions. For sustainable innovations to find room in the market and gradually reshape current unsustainable mechanisms, participants called for international tangible political and financial efforts towards green innovation.

Those claims find ties in the current literature asserting that the establishment of innovation ecosystems necessitates the presence of not only innovators and their offerings, but also a demand for such outputs, supported by a regulatory framework that encourages such processes (Adner, 2006). Namely, several participants highlighted the importance of local subsidies or European upcoming reporting rules (e.g. CRSD) on the development of their startup, in both the start-up and scale-up phases. In fact, data report that the demand for green innovation is not simply driven by the level of education and purchasing power of the population, but is shaped by top-down regulations which modify the strategies and priorities of incumbent firms

and corporations: "Let's say institutions create the demand, and us we create the answer to that." Emitwise, 2; "But the real task is being dealt with by the biggest companies, because every time they move, even small things, it will create great results. [...] the biggest companies are the ones that should also take the biggest responsibility." Hey!Planet, 2.

In order to bridge the gap between top-down and-bottom up innovation efforts, supranational institutions should systematically facilitate the adoption of green innovations through binding sustainability-focused regulations, tackling both the demand and the supply of green solutions. One example would be the Climate Law or the Corporate Sustainability Reporting Directive (CSRD), which will push actors to report their emissions from scope 1 (direct emissions) to scope 3 (supply-chain-relative emissions). Such dynamics bring to light the importance of open innovation for both incumbent firms and green startups (Lee, 2007).

### **6.3.2 Institutions must accelerate market economic dynamics**

Referring to Schumpeterian theories on creative destruction, data reveal how the current historical period is characterised by the production of innovations that destroy mainstream paradigms and assumptions proper to the given sector (Kopp, 2021). In fact, as claimed by one of the participants and indirectly assessed by the rest: "The "startup moment" is a very normal part of how the economy goes: Schumpeter's creative destruction is happening now: looking back we will see that this is the moment where the new players of tomorrow will have emerged, you will nor refer to them as startups anymore." Tado, 2.

As claimed by the World Business Council For Sustainable Development (2020) and the consulting firm Roland Berger (2020) current years are characterised by a combination of unstable factors, entailing public health, global warming and geopolitical tensions. Those issues underline how current economic policies should follow extraordinary paths to tackle the

climate crisis, source of many of the issues related to the mentioned instabilities. Forcing the economic transition between the above mentioned steps is surely costly, but being in an emergency, there is no time for conventional market re-allocations of production factors: data underline how an accelerating force is needed, and must be generated from democratic institutions. Such policies must be pursued through an approach that is mindful of territorial dynamics delegating part of the faculties, as well as of responsibilities for its development, to individual regions, with the latter having a clearer understanding of the opportunities and challenges to tackle.

The Schumpeterian economic cycles of creative destruction will inevitably occur, resulting in a transition to greener alternatives. However, this transition must occur at an accelerated pace, necessitating the provision of financial resources and a supportive legal framework. Participants flagged several times how, in general, incumbent firms want to implement greener solutions, but may de-prioritise such process because of its costs. Indeed, this support must extend to both innovative green startups and incumbent firms, as the costs associated with this transition should not be borne solely by citizens. Policymakers must then build a framework that amortises these transition costs allowing driving forward progress on green innovation, acting as if those were emergency-measures, leveraging the full potential of European institutions.

If the European Union sets decarbonization goals, the legal framework can't disregard concrete financial support to those actors who produce sustainable solutions that can decarbonise current systems. Supporting the development of bottom-up green innovation fosters the production of readily implementable solutions within larger incumbent firms as well as food, buildings and infrastructural systems. This has the potential to drive a wide and fast transition towards environmental sustainability through the positive spillover effects of such innovations when applied to large-scale production systems. As mentioned in the previous sections, through an analysis of the selected sample, the fostering factors for such a transition seem to be: environmental sensitivity of actors and institutions; education; highly skilled talent pools and



a business friendly environment entailing human resources and hubs that support the marketing phase of green solutions.

Thus, in order to enforce a net-zero transition, policymakers should leverage these factors, both through legal reforms and financial measures.

### **6.3.3 The importance of investing in high-talented clusters and innovation hubs**

Investing in education, particularly in the fields of business, sustainability, engineering and technology resulted in an important focus to foster green innovation. Moreover, data reveal how it is important to note how a balance between business-centred approach and an impact-focused approach must be obtained through education, in order to avoid cases in which sustainability is merely seen as a business opportunity. In this framework, participants highlighted the benefits that specialised education pools bring, both in providing the necessary skills and interest to tackle the climate crisis, and both in facilitating the networking between talent. Indeed, a large portion of the interviewed actors claimed to be part of a green innovation cluster, highlighting how in those contexts there is an increasing focus on sustainability.

### **6.3.4 The importance of investing in Innovation hubs**

Data reveal that a particular emphasis must be placed on supporting the creation and activities of innovation "melting pots", in which innovators exchange between peers and meet incumbent firms and corporations. Those environments may take the form of accelerators, incubators or simply innovation co-working hubs (both academic related and open). Such structures would indeed provide tangible networking opportunities for *innovators to work on*

*the development of their solutions, as well as for incumbent firms to provide challenges and get informed (or directly participate) on the latest solutions' developments. They indeed convey the potential of green innovations with the needs of incumbent firms.*

Furthermore, the opportunity for green startups to take part in international events on innovation emerged as highly beneficial, as green entrepreneurs can network with developed startups, green ventures, investors and incumbent market actors, getting insights on the current status quo of innovation in several sectors and exchanging best practices. Participants flagged several times how markets are opening up to implementing green solutions, due to the presence of both market gaps and an increasingly sustainability-attentive demand. Thus, in concrete terms, Europe should leverage its power in conveying both talent and demand, investing in direct channels between firms and research and education institutions. Data show how in this picture, namely Sweden, The Netherlands, Germany and Norway can serve as examples to other European Countries (e.g. the "teacher exemption" Swedish law for students' patents; Tado,1).

If Europe sets itself decarbonisation targets, the most efficient strategy to implement is to transmit these targets to the demand and supply of goods and services in the marketplace, stimulating a change that leads both sides to converge on the implementation of green solutions: "I think it's obviously in the EU's best interests to provide additional funding for green startups [...] it fits in the overall ethos of Green Deal's ideals." GridX, 3.

These stimuli have to be processed through policies adapted to the target group, i.e. on the one hand, through investments in technical, commercial and environmental education and the relative hubs, and on the other hand through laws for the adoption of less polluting systems supported by fiscal buffers.

### **6.3.5 Impact of European Funds on Green Entrepreneurship: a Buearucratic treshold**

Europe, in the light of the European Green Deal, must more concretely support bottom-up innovation, reviewing its funding mechanisms. Through measures like the "Fit for 55" Package, Climate Law or the Corporate Sustainability Reporting Directive (CSRD), Europe proves its efforts in stimulating both decarbonisation efforts and green solutions' implementation. In addition, those efforts are backed by funding programmes, such as the Next Generation EU", which provides funds for green innovation mainly in the form of grants, Horizon Europe, specifically targeting ESG-related research and innovation or again, Climate Awareness Bonds, the Climate Law or again The European Taxonomy.

Nevertheless, within the selected hotspots, qualitative data on the current relationship between green startups and European funding tools for innovation highlight a barrier between these two spheres. Namely, from the interviews it emerged that only three participants benefit from European funds and to a small extent. The rest of the participants don't use any funds released from European Institutions, revealing a financial gap between bottom-up and top-down decarbonisation efforts.

#### **6.3.5.1 Risky, Money and time consuming procedures hamper access to EU funds.**

The vast majority of the interviewees claimed that the application procedures to obtain European fundings are too complex and too time-consuming. Data reveal a sentiment of discontent for what concerns such mechanisms, whose compliance normally implies the employment of a consultant and may last several months. This sentiment of discontent is mainly relative to the bureaucratic barrier that startups need to breach in order to obtain EU funds: its "complexity" prevents entrepreneurs from undertaking such application procedures,

as they imply the use of monetary and time resources that fragile entities such as startups tend not to dispose of. In fact, during the interviews it has been stressed how investing large amounts of money (for a newly formed firm) in application processes that may even lead to failure is a risk that small entities like startups won't take. Furthermore, data reveal that often green entrepreneurs don't have an easy access to the information relative to the opportunities for innovation offered by the European Union, underlining how distant these two "private" and "public" spheres are, although they formally have the same objective. It was claimed that those processes are consequent both to the size of institutions and of funds. Namely, being normally considerable amounts of money, EU funds attract many applicants on an international level, requiring a complex set of bureaucratic and security procedures for their allocation.

#### 6.3.5.2 Mismatch between bottom-up and top-down efforts.

This mechanism lowers the chances to obtain such funds, and underlines how the extent of the procedures (in terms of amount of money bestowed, number of applicants, time needed and files needed) doesn't match the small and variable reality in which startups operate. Thus, from the analysed sample, it emerges that impact-focused startups don't access European Funds for innovation because of a bureaucratic threshold that implies time and money resources that entrepreneurs deem as excessive. In this framework, from both the working experience of the author within the project and the qualitative data obtained, it appears paradoxical that fundings programs targeting ESG R&I allocate more than half a billion euros to a networking project which relies on the implementation of sustainable solutions (Net Zero Cities) but do not provide a tangible support to the actors that produce such solutions.

#### 6.3.5.3 Need to favour impact over bureaucratic skills

Indeed, data obtained suggest that although the current legal framework for bottom-up innovation is appreciated, it must be characterised by features that may require the reorganisation of existing processes and implementation of additional funding mechanisms. Those findings partially reflect Cojoianu et al.'s (2021) theories, which underline how in the last decades governments have failed to implement environmental protection services, allowing the charge for a green transition to fall into SME's hands, with the emergence of the concept of green impact investing (Investopedia.com, 2022). In this frame, few participants underlined how in those allocating procedures, the administrative performance of applicants tends to overshadow other more important aspects for funds' allocation, such as their environmental impact and potential.

It emerged that within the bureaucratic barrier between the two spheres, there is a bureaucracy-centred economy that benefits from the processes that those procedures imply, into which important portions of the investment provided by applicants leak. Indeed, although procedures for fundings allocation are pivotal, especially considering the significant amount of funds bestowed, their current mechanisms prevent small entities from deriving benefits from them, highlighting a discrepancy between the European efforts to tackle sustainable innovation and the current circumstances. Indeed, backing the statements published by the European Committee of the Regions in the publication "Financing the Green Deal" (Gancheva et al., 2021) the current funding mechanisms supporting the Green Deal's objectives put in competition an excessive number of actors, creating a non-optimal innovation groundwork that favours "larger or more experienced entities", who have stronger administrative skills with respect to smaller actors with less available tools and experience in preparing such applications.

## **6.4 Changes needed:**

### **6.4.1 Streamline bureaucratic procedures and improve communication**

To these regards, participants claimed that an interesting strategy would be to allocate smaller amounts of funds under impact-focused applications, in order to stimulate green innovation on a wide scale. Such a strategy could be particularly useful in the cases of directly managed or shared managed funds (e.g. Horizon Europe, InvestEU), as the allocation processes may follow simpler procedures compared to indirectly managed funds, which entail additional European institutions (e.g. the EIB). Also, this would partially de-risk investments, without linking environmental performances to administrative skills or costs.

In this picture, part of the human resources normally employed in the administration ecosystem could actively support green innovators in their scaling-up phase.

The processes above-described are summarised in the following scheme (Fig.2):

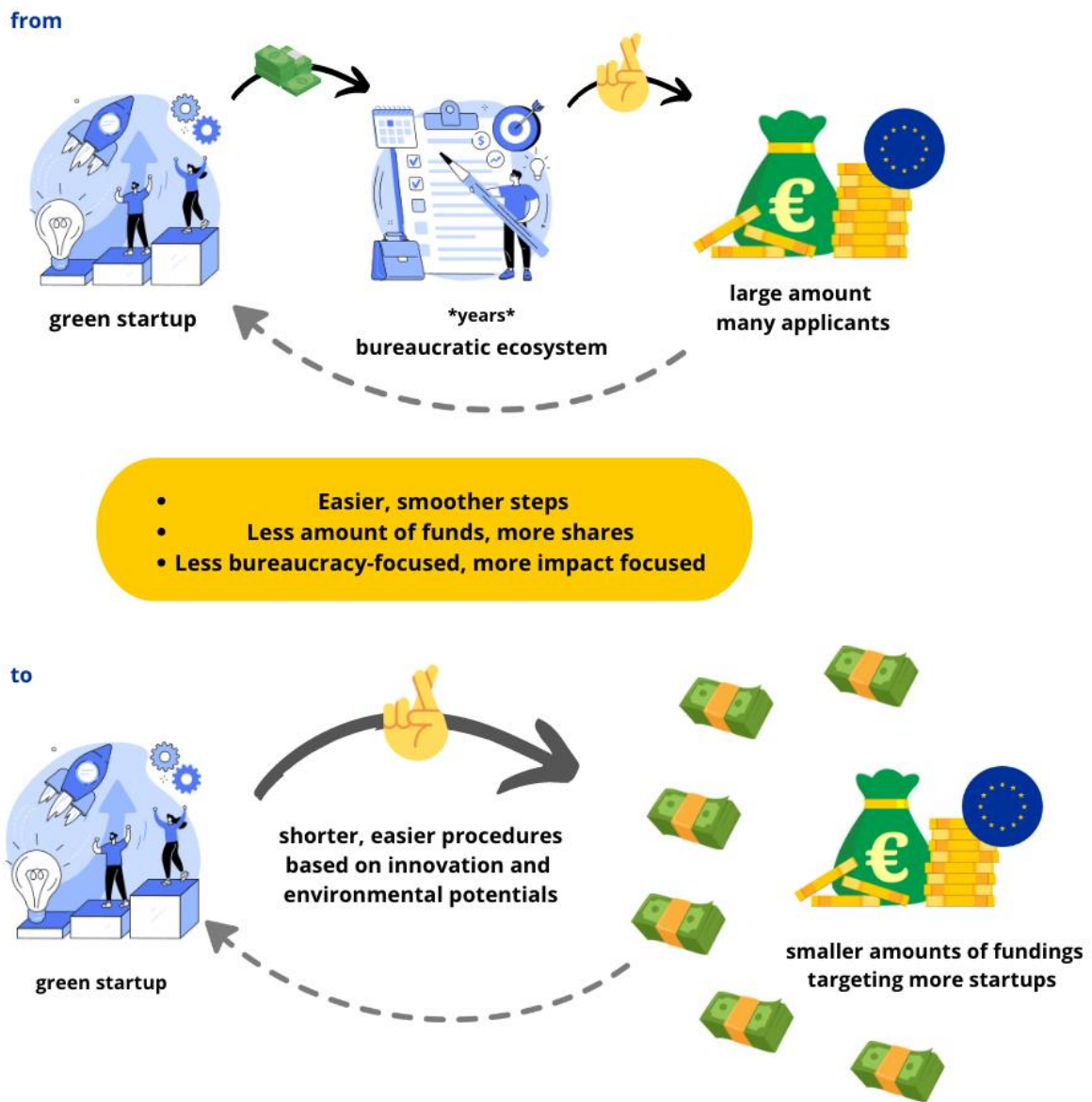


FIG. 2: ENVISAGED FUNDING MECHANISMS' CHANGES, SOURCE: AUTHOR'S OWN COMPILATION, 2023.

## 6.4.2 Enhance the focus on the impact

Public financial support would be highly beneficial, especially in the scaling-up phase, as it would ease fundraising efforts, allowing green startups to focus more on the impact of their solutions. Indeed, several participants claimed how fundraising is the most challenging step within a startup's development and how dealing with private fundings implies complying with a set of business-oriented market logics that may lead green startups to be increasingly profit-driven. Many underlined how the most important thing for an impact-based solution is to make it market-viable, as without returns on investment, a starting up firm can't further develop nor implement its innovation and scale-up. Still, this might drive the attention away from the impact, as mentioned by one of the interviewees, "forget(ing) why we were born" (Humbee, 3), a process which switches the focus from having a positive impact on the environment and society towards the increase in returns on investment.

Data indeed show that this is a process that may lead to the principle for which environmental impact is secondary to the business performance in absolute terms: : "Silicon Valley is a money-making machine [...] some of the ecosystems, of the accelerators in the UK and Europe that were more sustainability-focused, it felt a lot more like charity creators and not business creators, they are very focused on the impact but not focused on how you can actually drive profitability" Emitwise, 4.

### **6.4.3 Overall benefits of funding mechanisms' reorganisation**

Reducing the sum of the respective funding packages can lead to a streamlining of the bureaucratic apparatus for their disbursement. Despite a logical increase in the number of applicants for these funds, this mechanism would redistribute entrepreneurs into a wider range of possible funds, which would give a more concrete meaning to the EU's commitments in terms of green innovation. Also, such support ensures stability in this process, which is beneficial both for entrepreneurs and for incumbent firms investing and relying on a product or service. Data also underline how those measures must be accompanied by tax reliefs for the adoption of green solutions. Participants indeed flagged how, often, switching to greener



alternatives doesn't fall under the priorities of incumbent firms or consumers, being directly proportional to the purchasing power of actors.

Thus, policymakers must create measures to absorb the jolts of the necessary acceleration towards greener systems, as it is important to ensure that the costs of this transition are not solely borne by firms.

#### **6.4.4 Supporting both the creation and demand for green innovation to lower costs**

Supporting both the creation and demand for green innovation will accelerate its implementation and lower the cost of green solutions. It is common for the impact claimed in the proposal phase by institutions to differ from the actual outcomes in reality. However, in the current historical context of the climate crisis, it is imperative that action be taken quickly and effectively to address the issue. The need for action is pressing and it is crucial that any inefficiencies in the funding mechanisms are addressed, so that resources can be mobilised to achieve the ambitious goals of the European Green Deal in a timely manner. Namely, the increase in production and implementation of green solutions combined to the increase in the demand for sustainable products along with the economies of scale lowers the average cost of each unit, leveraging the spillover effects of green innovations when applied to large systems.

Nevertheless, in this framework it must be underlined that the European Commission is actively implementing policies for a sustainable transition of the Union's economy, through Grants (e.g. the Next Generation EU) or more complex types of support (e.g. the European Taxonomy, Horizon Europe, the Just Transition Mechanism). An example are the many projects under Horizon Europe's umbrella, aimed at providing tools and knowledge for the sustainable management of different entities (e.g. Clearing House). The issue that emerges

from the findings is indeed not addressed to the funding projects themselves, but to the fact that their funds seem to not trickle down from research and networking environments to green innovators.

## Chapter 7: Conclusions

### **Implications of this study**

This research proposes an outlook on the state of the art relative to the green innovation scene in Europe, highlighting which factors foster its development. Furthermore, the study proposes an insight on the current relationships between green startups and the innovation funding schemes of the European Union entailed in the broader picture of the European Green Deal. The main conclusions are hereby displayed, followed by a set of recommendations for public and private actors that aim to foster green innovation on both the supply and demand sides. It must be taken into consideration that the level of consistency of the findings obtained is counterbalanced by the relatively small size of the sample analysed.

### **7.1 Outlook on the status quo of green innovation in Europe**

Green innovation concentrates unevenly throughout European regions, resulting in the presence of scattered hotspots. Still, those hotspots tend to concentrate in the central-northern regions of Europe, namely in: Germany, United Kingdom, Sweden, France, Netherlands,

Norway and Denmark. Thus, Green innovation in these regions seems facilitated by a favourable environment that promotes the development of key factors for growth. From the related qualitative data it emerged those key factors consist in a skilled and highly-specialised network of talents, namely in business and technical disciplines; an environmentally-aware population and education; the presence of physical hubs for innovation; programs, events and funds for the marketing of innovation; a legal framework increasingly supporting the adoption of green solutions. Furthermore, the selected regions, and mostly northern countries, feature dynamic economies and a relatively high purchasing power of the population, factors which ease the transition to new greener paradigms.

## **7.2 Main influential factors and implications**

Data revealed how the transition to net zero emissions in Europe is being propelled by the efforts of green firms, whose dedication to sustainable solutions is driven by a strong sense of the urgency and gravity of the climate crisis. Green entrepreneurs are actively engaged in identifying and implementing environmentally friendly options, due to their deeply held belief in the criticality of addressing this issue. Green solutions are not just a solution to a market gap in the economy, but also a response to increasing consumer demand for sustainable products. A dynamic economy, characterised by openness and adaptability, is essential for the successful implementation and uptake of green innovations. This is because a dynamic economy allows for the identification of market gaps and the emergence of new technologies and business models that address these gaps. Furthermore, it enables the dissemination of these innovations to the wider population through increased awareness, education, and investment. Therefore, the successful implementation of green innovations is heavily dependent on the ability of an economy to adapt and evolve in response to changing consumer preferences and technological advancements. Indeed, green start-ups bring concrete innovation, but the "control room" is in the institutions. Only if there is coordination and mutual support between institutions and

innovators can the net zero transition materialise as quickly as possible in a democratic and international system.

### 7.3 Challenges for policymakers and local administrations

As global warming and overpopulation intensify, the clear need merges for an accelerating force that guides the "invisible keynesian hand" to tackle the right levers to effectively reach a net-zero economy by 2050. Indeed, when analysing the European institutional funding mechanisms, data revealed that public European efforts tackling sustainable innovation often leaks into a complex bureaucracy-focused structure. Despite the theoretical potential for collaboration between small enterprises and European institutions in fostering green innovation, there are practical barriers that hinder the actualization of this collaboration. These barriers are rooted in differences in paradigms and priorities between the two entities, which result in an inefficient support system for green entrepreneurship, in which part of both parties' sustainability-focused efforts leak into a complex bureaucracy-focused structure.

The lack of an effective collaboration between these two key players is a missed opportunity to accelerate progress towards the goal of net zero emissions. To overcome these barriers, the European Union's remarkable efforts in the political and financial transition must be accompanied by an effective support to bottom-up innovation,

**namely by:**

- **Supporting** green innovation's production and demand through funding and favourable political and fiscal regulations.

- **Streamline** public funding mechanisms to support green innovators in founding and scaling up their solutions increasing the focus on product's environmental impact.
- **Leverage** economies of scale to lower cost of green solutions through tax reliefs for incumbent firms and active support to education, innovation hubs and entrepreneurs.
- **Improve** the communication of innovation-focused opportunities (events, funds, tenders) leveraging positive spillover effects on a larger scale.

#### **Investments must tackle:**

- **Education and Public research and information**, in particular business, engineering, technological and sustainability disciplines.
- **Ad hoc structures that converge innovators with incumbent firms**, for which tangible best practices can be withdrawn by countries like Sweden.
- **Innovators and incumbent firms**, to converge bottom-up, business and top-down sustainability efforts.

### **7.3 Final Remarks**

Thus, for a successful and tangible green transition, the European Union must harness the benefits of economies of scale through the convergence of three key elements. Firstly, green innovation policies under the umbrella of the European Green Deal must be strict, clear, and transversal. Secondly, to bridge the gap between top-down and bottom-up green innovation efforts, Europe must leverage public research and bolster networking hubs to strengthen the relationship between incumbent firms and corporations and green entrepreneurship. Finally, European institutions must simplify fundings procedures, targeting part of their focus on green entrepreneurship and enhancing the related communication. Supporting green innovators will catalyse the transition to a net-zero economy by promoting a process of creative destruction,

increasing the popularity and decreasing the cost of green solutions. This, in turn, will hasten the achievement of the goals of the European Green Deal, as incumbent firms will be better positioned to transition to greener alternatives and green entrepreneurs will be better supported in developing and producing solutions. Furthermore, the support of networking structures and events would foster the connection between these two fundamental spheres of the economy, allowing for a concrete manifestation of European's laudable efforts to transition to a net-zero economy.

This support will lead to a process of creative destruction, increasing the popularity and decreasing the cost of green solutions, accelerating and concretising the manifestation of the European Green Deal's goals. It is imperative that these processes are implemented expeditiously, given the urgency of the climate crisis. Indeed, as mentioned by Naomi Klein in her book "On fire" such an emergency must be treated as any other emergency situation, leveraging all available resources and institutional capabilities to their fullest extent.

## **7.4 Recommendations for further research:**

As mentioned in the limitations chapter of this study, this analysis doesn't have all the means to elaborate in a complete manner the whole processes that characterise the surge and future of green entrepreneurship. Therefore, additional studies are needed.

When addressing the fostering factors for green innovation, this research provided several findings, entailing a great environmental sensitivity of both the entrepreneurs (for some emerged during education years) and the demand. Still, those results don't explain why in those countries education is able to raise awareness on environmental issues, and why the society (entailing people not necessarily involved in the education system of the country) cares about

the environment. It is true that this study partially highlighted that some actions being taken by local governments support environmental awareness, but didn't examine the core motivations for which a culture in general focuses on such issues more than others. Future research could indeed delve deeper into the reasons that drive an economy or context to be more sustainability-sensitive than others, further examining the intricate relationships between social, economic, geographical and cultural influences that shape individuals' perspectives towards the environment. Namely, understanding the determinants of sustainability-sensitive contexts would help identify potential leverage points to foster more environmentally-oriented behaviours and economic systems, inspiring the design of policies and interventions aimed at promoting the transition towards a green and sustainable future.

Another area of investigation could focus on the impact of digitalization on the nature and dynamics of innovation mechanisms. While context-based ecosystems still exist, the increased usage of digital technology in recent years has drastically changed the landscape of innovation and entrepreneurship and created new chances for green solutions to scale up and enter international markets. Namely, future research could shed light on the role of digitalization in facilitating green innovation, while posing new challenges on social aspects, linking these issues on the literature on local sectoral specialisation, and the role of knowledge spillovers in these processes.

Finally, future research could examine the potential geopolitical implications of green solutions and their contribution to the economic and thus energetic stability within the European Union.

# ANNEXES:

## Annex. 1: Table of Rankings

Website	Date accessed	Source	Germ any	U K	Swe den	Fran ce	Nether lands	Nor way	Den mar k
<a href="https://thegerda.medium.com/top-10-promising-green-startups-combating-pollution-and-global-warming-5ef40e478da2">https://thegerda.medium.com/top-10-promising-green-startups-combating-pollution-and-global-warming-5ef40e478da2</a>	12/07/22	Medium.com	0	1	1	1	0	0	0
<a href="https://startupsmagazine.co.uk/article-top-10-sustainable-tech-startups-2021">https://startupsmagazine.co.uk/article-top-10-sustainable-tech-startups-2021</a>	12/07/22	Startup Magazine	1	6	0	0	0	0	2
<a href="https://thenextweb.com/news/meet-the-top-9-european-startups-working-towards-a-greener-future">https://thenextweb.com/news/meet-the-top-9-european-startups-working-towards-a-greener-future</a>	12/07/22	The Next Web	0	0	1	0	1	2	0
<a href="https://storm4.com/storm4-voice/intel-bites/top-ten-esg-europe-us/">https://storm4.com/storm4-voice/intel-bites/top-ten-esg-europe-us/</a>	15/07/22	Storm4	1	0	1	1	0	0	0
<a href="https://www.eu-startups.com/2021/05/10-promising-circular-economy-startups-to-watch-in-2021/">https://www.eu-startups.com/2021/05/10-promising-circular-economy-startups-to-watch-in-2021/</a>	15/07/22	EU Startups	2	1	0	1	0	1	0
<a href="https://www.positive.news/society/20-startups-making-waste-history/">https://www.positive.news/society/20-startups-making-waste-history/</a>	23/07/22	Positive News	1	1	1	1	1	0	0



<a href="https://www.startupblink.com/startups:text/industry=2">https://www.startupblink.com/startups:text/industry=2</a>	23/07/22	StartupBlink	13	9	5	5	2	4	4
<a href="https://www.cledara.com/blog/fashion-tech-startups-europe">https://www.cledara.com/blog/fashion-tech-startups-europe</a>	23/07/22	Cledara	6	11	3	3	4	0	1
<a href="https://www.businessinsider.com/climate-change-environmental-technology-startups-2020">https://www.businessinsider.com/climate-change-environmental-technology-startups-2020</a> <a href="https://www.businessinsider.com/climate-change-environmental-technology-startups-2020-11?r=US&amp;IR=T">https://www.businessinsider.com/climate-change-environmental-technology-startups-2020-11?r=US&amp;IR=T</a>	08/08/22	Businessinsider	3	4	2	1	2	2	1
<a href="https://www.failory.com/startups/greentech">https://www.failory.com/startups/greentech</a>	08/08/22	Failory	2	0	0	1	0	3	0
<a href="https://aclima.eu/six-new-innovative-startups-shortlisted-for-european-circular-award/">https://aclima.eu/six-new-innovative-startups-shortlisted-for-european-circular-award/</a>	10/08/22	Aclima	3	1	0	1	0	0	0
<a href="https://www.crunchbase.com/hub/european-union-renewable-energy-companies">https://www.crunchbase.com/hub/european-union-renewable-energy-companies</a>	10/08/22	Crunchbase	3	0	0	0	2	0	2
<a href="https://www.paysalia.com/en/blog/green-city/start-ups-building-green-urbanism">https://www.paysalia.com/en/blog/green-city/start-ups-building-green-urbanism</a>	11/08/22	Paysalia	1	1	2	1	0	0	0
<a href="https://www.valuewalk.com/top-ten-green-european-startups/">https://www.valuewalk.com/top-ten-green-european-startups/</a>	11/08/22	Valuewalk	3	0	2	0	0	1	0
<a href="https://sifted.eu/articles/norrskan-100-impact-list/">https://sifted.eu/articles/norrskan-100-impact-list/</a>	23/08/22	Sifted	5	9	12	4	2	1	1
<a href="https://www.norrskan.org/impact100">https://www.norrskan.org/impact100</a>	23/08/22	Norrskan	7	9	13	3	0	1	0
<a href="https://app.dealroom.co/lists/31174">https://app.dealroom.co/lists/31174</a>	11/09/22	Delaroom	14	14	3	5	6	4	0
<a href="https://www.siliconrepublic.com/start-ups/climate-tech-startups-europe-environment-technology-funding">https://www.siliconrepublic.com/start-ups/climate-tech-startups-europe-environment-technology-funding</a>	15/09/22	SiliconRepublic	1	5	1	0	1	0	1
<a href="https://europeangreenaward.com/portfolio-items/ara-en/?portfolioCats=97">https://europeangreenaward.com/portfolio-items/ara-en/?portfolioCats=97</a>	07/10/22	European Green Award	8	1	1	0	0	0	0

<a href="https://www.eu-startups.com/2022/12/10-european-wind-energy-startups-that-will-blow-you-away/">https://www.eu-startups.com/2022/12/10-european-wind-energy-startups-that-will-blow-you-away/</a>	11/10/22	EU startups	1	1	1	1	1	1	0
<a href="https://tech.eu/2022/12/20/the-top-5-european-climate-tech-funding-deals-of-2022/">https://tech.eu/2022/12/20/the-top-5-european-climate-tech-funding-deals-of-2022/</a>	11/10/22	TechEU	1	0	1	0	1	0	0
<a href="https://www.eu-startups.com/2022/11/8-cleantech-startups-catching-our-eye-for-the-year-ahead/">https://www.eu-startups.com/2022/11/8-cleantech-startups-catching-our-eye-for-the-year-ahead/</a>	23/11/22	EU Startups	4	0	1	3	0	0	0
<a href="https://www.ventureradar.com/startup/ESG#">https://www.ventureradar.com/startup/ESG#</a>	05/12/22	ventureradar	2	2	1	0	0	0	1
<a href="https://sifted.eu/articles/meet-europes-green-deal-startup-heroes/">https://sifted.eu/articles/meet-europes-green-deal-startup-heroes/</a>	18/12/22	SiftedEurope	5	2	3	9	1	7	4
<a href="https://www.startus-insights.com/innovators-guide/discover-5-top-food-tech-startups-advancing-sustainability/">https://www.startus-insights.com/innovators-guide/discover-5-top-food-tech-startups-advancing-sustainability/</a>	20/12/22	StartUs	0	0	1	0	0	0	1
<a href="https://causeartist.com/foodtech-startups/">https://causeartist.com/foodtech-startups/</a>	10/01/23	Causeartist	3	0	0	2	0	0	1
<a href="https://www.emprenemjunts.es/?op=8&amp;n=27309&amp;lang=3">https://www.emprenemjunts.es/?op=8&amp;n=27309&amp;lang=3</a>	10/01/23	Emprenemjunts	0	0	0	2	3	0	0
<a href="https://www.digitalfoodlab.com/european-foodtech-top50-2021/">https://www.digitalfoodlab.com/european-foodtech-top50-2021/</a>	10/01/23	DigitalFoodlab - Foodscience	1	3	2	2	2	0	0
TOT N. CIT./COUNTRY			91	81	58	47	29	27	19

Website	Date accessed	Source	Spain	Finland	Belgium	Italy	Austria	Portugal
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<a href="https://theherda.medium.com/top-10-promising-green-startups-combating-pollution-and-global-warming-5ef40e478da2">https://theherda.medium.com/top-10-promising-green-startups-combating-pollution-and-global-warming-5ef40e478da2</a>	12/07/22	Medium.com	0	1	1	0	0	0
<a href="https://startupsmagazine.co.uk/article-top-10-sustainable-tech-startups-2021">https://startupsmagazine.co.uk/article-top-10-sustainable-tech-startups-2021</a>	12/07/22	Startup Magazine	0	0	0	0	0	0
<a href="https://thenextweb.com/news/meet-the-top-9-european-startups-working-towards-a-greener-future">https://thenextweb.com/news/meet-the-top-9-european-startups-working-towards-a-greener-future</a>	12/07/22	The Next Web	0	1	0	0	1	1
<a href="https://storm4.com/storm4-voice/intel-bites/top-ten-esg-europe-us/">https://storm4.com/storm4-voice/intel-bites/top-ten-esg-europe-us/</a>	15/07/22	Storm4	0	0	0	0	0	0
<a href="https://www.eu-startups.com/2021/05/10-promising-circular-economy-startups-to-watch-in-2021/">https://www.eu-startups.com/2021/05/10-promising-circular-economy-startups-to-watch-in-2021/</a>	15/07/22	EU Startups	1	1	0	1	0	0
<a href="https://www.positive.news/society/20-startups-making-waste-history/">https://www.positive.news/society/20-startups-making-waste-history/</a>	23/07/22	Positive News	1	0	0	0	1	0
<a href="https://www.startupblink.com/startups:text/industry=2">https://www.startupblink.com/startups:text/industry=2</a>	23/07/22	StartupBlink	0	0	0	0	0	0
<a href="https://www.cledara.com/blog/fashion-tech-startups-europe">https://www.cledara.com/blog/fashion-tech-startups-europe</a>	23/07/22	Cledara	2	0	0	0	0	0
<a href="https://www.businessinsider.com/climate-change-environmental-technology-startups-2020https://www.businessinsider.com/climate-change-environmental-technology-startups-2020-11?r=US&amp;IR=T">https://www.businessinsider.com/climate-change-environmental-technology-startups-2020https://www.businessinsider.com/climate-change-environmental-technology-startups-2020-11?r=US&amp;IR=T</a>	08/08/22	Businessinsider	0	1	1	0	0	0
<a href="https://www.failory.com/startups/greentech">https://www.failory.com/startups/greentech</a>	08/08/22	Failory	0	0	0	0	0	0
<a href="https://aclima.eus/six-new-innovative-startups-shortlisted-for-european-circular-award/">https://aclima.eus/six-new-innovative-startups-shortlisted-for-european-circular-award/</a>	10/08/22	Aclima	0	1	0	0	0	0
<a href="https://www.crunchbase.com/hub/european-union-renewable-energy-companies">https://www.crunchbase.com/hub/european-union-renewable-energy-companies</a>	10/08/22	Crunchbase	1	0	0	0	0	0
<a href="https://www.paysalia.com/en/blog/green-city/start-ups-building-green-urbanism">https://www.paysalia.com/en/blog/green-city/start-ups-building-green-urbanism</a>	11/08/22	Paysalia	0	0	0	0	0	0
<a href="https://www.valuwalk.com/top-ten-green-european-startups/">https://www.valuwalk.com/top-ten-green-european-startups/</a>	11/08/22	Valuwalk	1	1	0	0	1	0
<a href="https://sifted.eu/articles/norrskan-100-impact-list/">https://sifted.eu/articles/norrskan-100-impact-list/</a>	23/08/22	Sifted	1	2	0	0	0	0
<a href="https://www.norrskan.org/impact100">https://www.norrskan.org/impact100</a>	23/08/22	Norrskan	1	0	0	0	0	0

<a href="https://app.dealroom.co/lists/31174">https://app.dealroom.co/lists/31174</a>	11/09/22	Delaroom	1	0	1	3	0	1
<a href="https://www.siliconrepublic.com/start-ups/climate-tech-startups-europe-environment-technology-funding">https://www.siliconrepublic.com/start-ups/climate-tech-startups-europe-environment-technology-funding</a>	15/09/22	SiliconRepublic	0	0	0	0	0	0
<a href="https://europeangreenaward.com/portfolio-items/ara-en/?portfolioCats=97">https://europeangreenaward.com/portfolio-items/ara-en/?portfolioCats=97</a>	07/10/22	European Green Award	0	1	1	1	0	0
<a href="https://www.eu-startups.com/2022/12/10-european-wind-energy-startups-that-will-blow-you-away/">https://www.eu-startups.com/2022/12/10-european-wind-energy-startups-that-will-blow-you-away/</a>	11/10/22	EU startups	1	0	0	0	1	1
<a href="https://tech.eu/2022/12/20/the-top-5-european-climate-tech-funding-deals-of-2022/">https://tech.eu/2022/12/20/the-top-5-european-climate-tech-funding-deals-of-2022/</a>	11/10/22	TechEU	0	0	0	0	0	0
<a href="https://www.eu-startups.com/2022/11/8-cleantech-startups-catching-our-eye-for-the-year-ahead/">https://www.eu-startups.com/2022/11/8-cleantech-startups-catching-our-eye-for-the-year-ahead/</a>	23/11/22	EU Startups	1	1	0	0	1	0
<a href="https://www.ventureradar.com/startup/ESG#">https://www.ventureradar.com/startup/ESG#</a>	05/12/22	ventureradar	0	0	1	0	0	0
<a href="https://sifted.eu/articles/meet-europes-green-deal-startup-heroes/">https://sifted.eu/articles/meet-europes-green-deal-startup-heroes/</a>	18/12/22	SiftedEurope	2	0	2	2	2	1
<a href="https://www.startus-insights.com/innovators-guide/discover-5-top-food-tech-startups-advancing-sustainability/">https://www.startus-insights.com/innovators-guide/discover-5-top-food-tech-startups-advancing-sustainability/</a>	20/12/22	StartUs	0	0	0	0	0	0
<a href="https://causeartist.com/foodtech-startups/">https://causeartist.com/foodtech-startups/</a>	10/01/23	Causeartist	0	0	0	0	0	0
<a href="https://www.emprenemjunts.es/?op=8&amp;n=27309&amp;lang=3">https://www.emprenemjunts.es/?op=8&amp;n=27309&amp;lang=3</a>	10/01/23	Emprenemjunts	1	0	1	0	0	0
<a href="https://www.digitalfoodlab.com/european-foodtech-top50-2021/">https://www.digitalfoodlab.com/european-foodtech-top50-2021/</a>	10/01/23	DigitalFoodlab - Foodscience	0	1	0	0	0	0
TOT N. CIT./COUNTRY			14	11	8	7	7	4

Website	Date accessed	Source	Ireland	Slovenia	Poland	Estonia	Lithuania	Hungary	Romania	Slovakia
<a href="https://thegerda.medium.com/top-10-promising-green-startups-combating-pollution-and-global-warming-5ef40e478da2">https://thegerda.medium.com/top-10-promising-green-startups-combating-pollution-and-global-warming-5ef40e478da2</a>	12/07/22	Medium.com	0	0	0	1	0	0	0	0

<a href="https://startupsmagazine.co.uk/article-top-10-sustainable-tech-startups-2021">https://startupsmagazine.co.uk/article-top-10-sustainable-tech-startups-2021</a>	12/07 /22	Startup Magazine	0	0	0	0	0	0	0	0
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## Annex: 2: Interviews

-In order of time

### Startup A - GER

1. Startup A was born in order to create batteries to store energy, providing a clear energy service for the energy market. Our mission is in fact to provide clean energy available 24/7 by storing energy. The vision from which we were born was to actually act for the climate, engaging by doing something related to our field of studies, but always for the sustainable development of the planet. It has also been a reason due to the fact that such services were not offered in the market until then: there was a gap in such technologies, not many companies around, so Startup A wanted to be an active part of the change. The market is waiting for this, the demand is there and is really high. The awareness of the war helped Europe and the energy field to invest in renewable technologies, for the planet and also for being self-sufficient, which for us was the only good thing of this war.  
- Interviewer: "You were born in Germany: which are the factors that helped you grow there?"  
- Interviewee: "So, in terms of factors helping us grow I would say not the facilities in terms of manufacturing industries because at an initial stage is more of planning a startup, but in terms of coworking. There was a strong interest that is at the base of the startup. Founders are from Munich and first they went to start up area, a nucleus area and used the facilities like coworking spaces for startups. In Munich there are many budlings where you can only and easily focus on your startup and project: you don't have to worry about the rent, about the bureaucracy and administration: you can get there with an idea, a project and a small team and work on that. There is a lot of collaboration with other teams, networking, sharing facilities, consistent collaborations and exchanges with universities.



Normally teams going there come from Universities, they are there because there are these places and these places are there because there is the need and the willingness to innovate. Then when you get bigger you can move out and be independent with your own office.

- Interviewer: “Are those coworking spaces public or from private businesses that create paying spaces for startups?”

- Interviewee: “Some of them are public and some private.”

2. I think that green innovation in Europe now is quite a bottom-up process: the startups are really pushing to get things done and into the market. We are the engine, much more than institutions and already existing firms: if we don't grow how will Europe reach net zero? Still, Europe is giving many funds that are helping so much.

3. Our investors they are mainly from Germany, the Netherlands, but also US, they are diversified. It's venture capital investors or capital investors mainly. We are also using public money from the EU, like EU Horizon Europe, European Accelerator program funds: they are helping us getting into the market faster.

- Interviewer: How much of your development is linked to these funds?

- Interviewee: From EU funds we actually get very little: we had the idea to do this project because the planet needs those technologies and there was a florid gap in the market, then we hoped to receive help from institutions. We are receiving funds from the Government too: the European Union is giving many many funds for innovation, but we are living mainly from our investors that I mentioned.

4. I've seen that from the increase in that kind of companies in this areas: Denmark, Holland, Netherlands, Austria. Germany. There is a lot, really a lot of demand coming up [point stressed many times during the interview]. There are many conferences and many meetings: there is an efficient approach on raw materials: you can share knowledge, help each other. This network building could be stronger, there is some path to still work on but this network, cluster in Europe of green innovation like the hi-tech cluster in the Silicon Valley with an increasing return to scale (sharing of knowledge, of structures, of talent): it is without any doubt blooming, don't

know if it is becoming that kind of cluster in that “Silicon Valley” sense, but is happening. This is, still, very dependent on the CEO initiative, personality, and networking talent, but in general it is blooming and expanding for sure, with ramifications.

## **Immofix**

1. Guillaume Ange created the startup: there were important problems concerning the energetic and structural situation of real estate in France, mostly in urban centres where buildings are really old. We thought about doing a “green loan” under the Immofix deal so that people could pay less taxes after our work, living in a building that is classified “A” on all parameters. Guillaume, by working in the real estate sector, really saw the need for more modern and less polluting systems, so that people could also pay less, all together. Indeed, in the process of developing the business model we spotted this tendency for clean energy renovations, with many solutions coming from universities that are starting focusing more and more on sustainability, mainly in northern regions: the green awareness comes from the north. In the last 10 years there has been the rise of impact assessment and sustainability focused businesses. Immofix by scaling-up its business model, is concretely helping to build a more sustainable world...I really feel like an “actor of change”, because we created the green loan and guide our clients in financial steps for renovating their homes giving many benefits, also through the issuance of bonuses. We want to stop the financing through banks that do greenwashing and really do something”. Originally the startup was born in Toulouse, then we moved to Paris: it is very important to be based in a city cause if you don’t have a network, you can’t really grow fast. The startup moved to Paris indeed to meet banks and investors: without this the startup would have died, I think. In Paris you have a consistent market, with clients that have structural needs, various stakeholders and important industrial actors. Then, in European capitals you can work more closely to institutions, both on the financial and on the legal side. With Immofix we had an influence on the legal framework concerning taxes on real estate: we created a renovation-service for which the taxes on oldest buildings are lower, so that owners can work

more easily on structural renovation. Our team grew in Paris, and we got some offices. Then if you have the chance to go in an incubator or accelerator then they challenge your BM and allow you to grow: we didn't do it because I own an incubator and I manage my startups development myself, but if I have to name the most important factors for our startup development I would say: legitimacy- a reason to be there and getting trust by people, power institutions, investors, your relationship with the media, your target, the academic -like universities or research centers I mean- that surrounds you and facilities where to develop your ideas. Immofix for example used coworking spaces in Paris: you meet people, like in "Station F", even if I don't think that being in a coworking space -or in one of those spaces that banks give you for developing products- with other startups can be determining for the success of a startup. It is more important in this respect to spend some time in an accelerator or incubator, in which people with experience in innovation are able to guide you. If coworkings are filled with people that are very useful for your purpose then it's a good place, but if the people working there with you are on your same level then it's not that useful, it is a sort of a business for wifi, food and beverage purchase but within a static environment where everyone has the same problems.

2. In terms of roles the startups can define the trend, but who is giving the direction, who has the market influence are big corporations : they actually then refer to startups to find innovation, they are side actors but with a main role for bringing innovation in corporations. You know big corporations do CSR, for example one of the main enterprises of France that is a big player in the oil industry is saying that sustainability is a priority but this is totally hypocritical. Often green startups make the cut into the market and then get absorbed by bigger corporations, they can bring innovation to front, but it often depends from the possibilities given by larger firms.
3. No we don't. We had a scale-up approach like many others. Startups or SMEs that obtain those European funds are able to get them because they have experts working for them usually. That also is a business: the actors that enable firms to get those important funds from European institutions make money out of those situation: they are also the ones knowing that those funds exist, many non-expert people don't get these information. It is a sort of preferential channel for those who already have contacts with those bodies: why there is never clear and publicized information on those funds? Why is information always hard to grasp? Then grants are really

consistent, they are large amounts of money. Getting funds for innovation is not as simple as we would want in order to accelerate a green transition. It is not that if you answer to the criteria you are going to have them: you have to face a set bureaucratic processes that is really huge and may last for years! Many firms, if they know about EU funds and their conditions, don't even engage in paying some consultant to do the EU funds applications because they would invest money in something they are not sure of! If they don't get the fund is wasted money, and a startup normally can't afford that, they don't even know if they will make it through the following years sometimes. In the green tech environment it is actually easier to have funds because the impact of their products can be seen or proved easily and fast. They have little constraints in terms of maintaining a "sustainable approach" coherence and the implementation of their solution is normally not hard.

4. I can see there is a network, you can see it also during international meetings. Is politics helping in this? No. There are actors that are engaging in creating a thick network, based on ESG, but those actors experience difficulties in positioning in the market : do they really have an impact? Is policy helping those actors having a real impact over big corporations? I am not seeing it. If it's always money leading the interest of policy and not real impact on resource efficiency and tackling climate change then how can we evolve towards that? You need to help sustainable development actors, connect them and prioritise this in political agendas. The dream of a green innovation ecosystem in Europe is possible only if policy works for structural changes. So many people, mainly young, have a lot of good will and inspiration to move towards greener systems, but the media space is not there for them! You talk about those things in podcasts but they are often listened by people who already agree with what they are saying! The main media channels, the ones that reach the mass, don't give enough space to those issues, the climate crisis and the support to related solutions are not top priority in the mind of an average citizen. You need a pushing force. It is not workers' fault, it's just the business models leading media companies and big corporations that lead them to avoid the climate discourse.

## **GridX - Ger**

1. The startup was born from the 2 co-founders who met at the University of Aachen: they saw that there was an inefficient market in the energy sector, they wanted to solve a gap in the energy market. I'll explain: they wanted to create a platform or device to optimize the energy technologies like residential batteries, heat pumps and so on. The founders are both in their mid 30s and when starting the business they were, and they are still of course, definitely concerned on climate change and...they also saw a gap, an opportunity in the ecosystem. They had this project of building a device and a platform that could help change the energetic system, since in the past there weren't a lot of those and of climate change awareness. So, the startup was born in Aachen and one of the founders is still working from there, the other is in Munich. There are a lot of engineering students in Aachen because of the good university, like software developers and software engineers. Then, our technology is cloud-based, so people can move from there if they want to and part of the business team decided to move to Munich because they knew that there is a good talent market there, on both software engineering but also business. They benefited from talent by the technical university of Munich, there you can find good business culture, engineering talent with business background, let's say...there are "talent pools" there.
  2. I think that green Startups are able to bring let's say a direct change...I think there will be hope that startups that are either bought out majority share or fully acquired to that extra funding and the scaling possibilities that are associated with that, would help with the reduction of GHG emissions and European energy mix.
  3. GridX has not taken any funds from any type of like EU funding or programs. From my understanding, it's all private. You know, like series A and Series B round of initial funding. I don't know to what extent the EU funds have contributed to green startups, from my experience in several EU renewable energy projects, there were not too many startups involved in these kinds of projects. So I don't know, I think it would be I'd be curious to see your research on if there's been any really good success stories coming out of direct EU funding, kind of like the early stages.
- Interviewer: Being a green startup and minding environmental protection, do you think you

need more funds during your early-stage years with respect to non-green startups?  
- Interviewee: That's a really good question. I think it's obviously in the EU's best interests to provide additional funding for green startups, I think. I mean, it fits in the overall ethos in Green Deal ideals. I also think it depends for green startup, to what specific part of the industry they're going for? I think, if you're going into some aspect of digitalization, then perhaps additional EU funding isn't as critical. But if you're trying to be part of the supply chain, then I think it's absolutely necessary. Just from an economies of scale standpoint, and from how cost efficient a lot of these larger producers are, especially coming out of like China, for instance. So I think it depends. At which parts of the renewable energy, let's call it revolution, or movement or Innovation Cluster, you're in. In general I hope there will be larger fundings.

4. I can speak partly from personal experience, and partly from work experience. From the personal experience, I'm sure you'll have the same after your masters is done. But a lot of your colleagues will go into sustainable startups or renewable energy companies. There's a lot of networking and clustering around these types of companies. Oftentimes, within the context of Munich, you will have a handful of people from the same master's program in the same company. So, I studied sustainable resource management at TU Munich. And you'll find people from that program and all different types of green innovation companies, whether it be in the startup sector, consulting sector, logistics, it'll come in a lot of different forms. And I think these kinds of master's programs are actually one helpful way to help these types of green companies bloom, I think there's that constant feed of passionate and smart talent. In terms of innovation in fact I think Germany does very well. I think especially in Munich, and Berlin, there's really good startup cultures. Very entrepreneurial driven people between the age of 20 and 30 something. And I also think Germany does a great job of providing an affordable education for international students. I paid only 130 euros per semester for mine [the interviewee is from the US, edit]. And that's not an opportunity given to a lot of non EU citizens. So I think that's also another way that Germany has set itself apart a bit, as far as bringing in international talent of really passionate, sustainability minded international students and future professionals. I can only speak for in that context from work, since I didn't have the opportunity to do my Masters anywhere else besides Germany.

- Interviewer: Are these masters new?

- Interviewee: The master I took part in is about 15 years old.

- Interviewer: In those contexts where you meet other startups, did you noticed where they were from?

- Interviewee: Yeah, there's a lot of startups coming out of the Netherlands in the green energy space for sure. That seems to be a really big hub and sectors of like e-mobility? Or, yeah, renewable energy. I would be curious to know what kind of innovation clusters are incubators or accelerators or university ecosystems kind of contribute to that. The Netherlands seems to be a bit of a standout when it comes to beyond Germany, when it comes to green startups. What conditions are for that? I don't know.

## **Hey!Planet - Den**

1. Hey!planet is Copenhagen based, and a lot of things are happening here. It is attracting for many green startups, unless they need some sort of production facility. You have to know that in this context some of the initiatives are created because you see a gap (like food waste) in the market. Togoodtogo is an example. Some actors do it for the potential of good investment, but for many it will be for a matter of the heart. The interest for food has never been bigger, greater than it is now. And actually, amongst these green initiatives, you see “solutions for solutions”. Meaning that it's not only that you can transform liquid food waste into cheese, it's also that you can have some tools to work with, like food waste, for instance, we have that example Toogoodtogo. That is a digital platform that served a purpose, was recognized as an object for capital funds and many have invested in it, because they can see a relevance of it now, and even though it's burning off cash, like losing money now, they keep on turning this investment. More money has been put in because investors know that it serves a purpose. So I think that some of the initiatives are created because you can see that there is a hole in the market for it and somebody will see it as a potentially good investment. And other will see this as a matter of the heart. And some will be in between. Some of these people from Togoodtogo are students from Danish Technical University. So they have the knowledge about food. But the resources to go

beyond that, would they have built a startup if there was huge uncertainty? Yeah, they would have, because it's important to them. It is something that they've been working on in school. And they saw potential market for this initiative, a small market maybe, but a potential market, and they would have done it despite EU funds. When I had discussion with them, they were looking for funds to sort of develop the product. Because it is, as with every other thing, it's very difficult to get on the market. So I think that the driver is depending on who you're talking to and on the sector. But I think that you will discover along the way that this is a way how to sort of develop your product. For many it will be relevant to look for funds, but the idea doesn't come from the possibility of getting funds. This is something which will be introduced along the way. I can see that with, hey!planet. There's a lot, a lot of passion in it, which I like, and honesty about what you're doing. So it's not constructed to be a billion dollar business, not in its current form, that it potentially could develop to it. But that's a different story. But the genuine idea was to do something for the planet, which was in the range of interest and capacity, and also something that we really like to do. With hey!planet we're trying to sort of attract some investors as well. Many saw high potential. We are talking to big companies like IKEA, and others that are looking into the possibility of taking in this product, and we are doing it now, which is interesting, because we [clients like IKEA, edit.] are approaching our product now like it was for plant-based food 10 years ago. Ten years ago, nobody wanted or even consider buying a plant instead of meat. Now it's completely safe, and it's delicious. So we have this company called "Simple feast, I don't know whether you've heard about it, but that's a plant based meal boxes that they're making. They're working on that on plant based, and it's really getting a hold on in Denmark. So that's also a startup, but he had the money with him, but he has been also a work of pulling in investors all the time, all the way, and that is the way to sort of grow your company. So I think you have to look at different segments: there's who just want to do niche, stay niche; who wants to cover a big area; and some who wants to go global, if possible. Like when it comes to healthy McDonald's chain, or whatever. So those people will be looking for funds. First and foremost, market powers are the same, the concept has to be viable. It can be a good idea, it could be the best idea in the world, you can save the planet, but if you cannot sell it, then it's not relevant. But I think that the political focus on this area is encouraging also: government was elected also for having a strong environmental policy, people want to see the change. When we asked the Danes about their opinion, to food waste,



everybody was “it's terrible, we're throwing up food equivalent to what a million people could eat every day”! So I think this is what could really push these companies have some political decisions on a general strategy on food. Politics should make some requirements on what kind of foods is made available, like for electricity requirements for new homes. So I think if you really want to do something about it, it's political, institutions have to state that this is the way we need to go if we're going to do things differently.

2. Well, startups can bring change, but they don't have the wheel. We can see clearly when Carlsberg for instance, decides to change the way they pack six beers, that will have major impact. The ones that are the biggest are the ones that can actually push this agenda. So, the green startups can supply solutions and create awareness. But the real task is being dealt by the biggest companies, because every time they move, even small things, it will create great results. But you should not underestimate the value of awareness: it is what has helped us in Denmark, to lower our food waste. So, awareness can bring us a long way, I'm sure, but the biggest companies are the ones that should also take the biggest responsibility.
3. Hey!Planet has not applied for EU funds, we are looking on domestic funds and domestic investors, people we can talk to, also. Because when you when you look for funds, there can be, a lot of administration and requirements. With the EU funds, it's a little complicated, you need somebody to guide you when you're doing it. Which means that a lot of these young people who are thriving on a great idea and have a digital approach to life, will start with the idea and put this on top look, see what kind of investments are available. I think that the bigger organizations are the ones that are pulling money from these projects, to sort of do something, but it is not easy to get public funds, mostly EU funds: they require a lot of work. This means startups have to be a little bit further in their own development before they can take in these kinds of assignments. There are a million things to do. And maybe you have one, maybe two partners, if you're lucky. You will be very, very occupied with everything on that side and looking for funds and doing that is more or less a job in itself. I think that for startups, maybe one should make smaller portions of money and make it easier for them to sort of get a hold of it. Startups have a lot of good intentions and are also looked at by bigger companies who are trying to sort of make some changes in their own products. They could really provide

knowledge and a better future, helping big companies. I think also the bigger companies could help smaller companies. But it's always a little bit risky, because they will have a very commercial angle on it.

4. I know that there's a lot of political ambitions about it, to sort of create a space for that kind of development. So it is an area of interest in general to attract both green tech and all kinds of environmental development firms. We want to sort of build a strong position in this country, which is why governments are making a lot of investment. I think they invested a billion dollars in plant based food because a lot of we can grow it ourselves so we want to be able to do it now here. Also I think actually that the Technical University of Denmark with all its international students is attracting. This could be an example of being able to draw some attention and call people have them come and do development here, this country. That university can be a portal, also to the EU funds, because they will have the knowledge, experience and resources to help with applications and probably the administrative burdens. But again, it depends on what is your business, your sector. If you facilitate the environment for green innovation and from the political side you work on education it could work. If we want to go green we have to invest. Funds should be more targeted. The countries that have shown interest and skills should be pushed forward in terms of funds: putting money because we can see you are engaging. If you prove that you can do green innovation, we will help you with funds, and maybe you can run into somebody that comes from for example Greece, but who doesn't have the environment to develop it. This could stimulate the countries that could say "ok we know that if we do that sort of things, we can get funded and develop our country with less effort and better outcomes".

## **Nordic Solar - Den**

1. Nordic Solar was my second start-up. The first one was not successful due to the financial crisis in 2008. So I started things up from scratch and grabbed and developed an idea that a former colleague had. We started the company together and when he gave up after 1½ year, I continued alone. The reason why we started in solar was mainly that other companies in Denmark were starting up in solar, and we therefore had a reference and access to solar projects. Also I had a

network in solar through a board position in Germany, and there we had the chance to find sponsors helping us start up. At the beginning the growth was very slow, as the scarce resource was money, it was hard to find funds and investors. Then, when I hired someone to help me raise money, things started developing faster.

2. I think startups are crucial to drive the growth in the green energy development. But what is really important is the industry support through regulation/industry framework and development of the electricity infrastructure. On top of this financing help within projects is very important.
3. We have never used anything else than private funding raised by ourselves and bank financing sourced by ourselves.
4. We feel we are a part of a fast growing industry with a good industry network in Denmark. You may call it a “solar cluster”. There is a handful of companies like ours that work together, learn from each other and attract employees to Denmark.
5. Yes. There must be a vision and a good framework and attractive for developing solar (and wind) in Europe. The most important is to create the infrastructure that we build on (inter connection and other electrical infrastructure) as well as energy storage solutions. Development of energy storage solutions / technology could be an area as well as making production of hardware (solar panels etc.) attractive in Europe, as we are right now very dependent on Chinese production.

## **ReVibe Energy - Swe**

1. ReVibe Energy is a spin-out<sup>1</sup> from a university entrepreneurship education called Chalmers School of Entrepreneurship together with incubator Chalmers Ventures (called Chalmers Incubator at the time) . The automotive SAAB Group contributed with a military technology which the founders of ReVibe commercialized for the civil industry. So I guess you can say a little bit of everything, a combination of tech push and market pull.
2. That's a difficult question, still, one but my guess is that for the *goal* of the Green Deal (carbon neutral EU until 2050) to come true the impact from startups won't be that significant, it is other and much larger processes that needs to change. Startups for sure have an impact, but they won't make the cut themselves.
3. Yes and no: we primarily private funds, then a part of EU funds are used to a smaller extent.
4. No, not so much anymore. We have moved away from that space simply because our potential effect on climate is so limited.
5. Yes, for sure, Europe is the world's largest trading bloc and has a very powerful economy.

## **Startup B - Swe**

1. Startup B was born to help transition our world to a more sustainable food system. Specifically, we want to close the taste and price gap between alternative meat and dairy products and traditional meat and dairy. There is a big unmet need for better fats to be used in these products and we have a technology platform that can solve this.

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<sup>1</sup> “A spinout is a type of corporate realignment involving the separation of a division to form a new independent corporation. The spinout company takes with it the operations of the segment and associated assets and liabilities”. (Investopedia.com, 2022).

2. Our approach helps with the sustainable food production goal of the Green Deal- but not sure how the policies can support us, we are contributing to developing economy in a sustainable way for sure, but we don't really know how those policies are affecting our own development.
3. We are not on the market yet and plan to launch in the US first, because we fall under novel foods regulation which is a very long process in the EU - we have not yet obtained any EU funds.
4. Actually I personally don't not feel part of a specific green innovation cluster. The Foodtech community is quite connected - but via private organizations – there are no publicly funded initiatives. We are connected digitally, but our sector is growing very much but I don't perceive it under the shape of a cluster.

## **Startup C - Nor**

1. So our owner spent time looking for these services and found no providers, seeing an opportunity to develop this type of services for other companies in addition to their already existing products or services. Let's say she saw a market opportunity, a market gap because there was a gap in sustainable alternatives.
2. For a smaller company with constrained resources, influencing legislation and policy is very resource consuming and for us not a priority. We monitor changes and actively use the tighter regulations as a positive force for change, but we do not feel like a central player in the European Green Deal. There is still a long way to go on the implementation side of things. So we would say that startups, and our customers, are and have to be pushing forces ahead of the EU.
3. We use private funds, but our second largest investor is a british PE-firm who has the EU investment fund as on of their biggest investors.
4. I actually feel part of a green innovation ecosystem somewhat, a sort of a cluster for green innovation collaboration...anyways, there could still be much better commercial arenas for

collaboration. There is a lot of activity within research and development, but commercial partnerships and arenas are lagging. We also see much more one-off activities like conferences where there is a lot of interest, but less everyday green activity in the day-to-day arenas like co-working spaces and so on: there is, but it would need improvements.

## **Tado° - Ger**

Energetic regulation technologies anti energy-waste based in Munich.

1. The two founders met at university in an entrepreneurship class, then they founded a communication-space startup, in 2011, they sold that and then they did conventional jobs. They tasted the blood and then they quit it and founded Tado: Christian is not from Munich but Johannes does: they had different options on where to host the company, one of the main reasons to choose Munich was due to fact that there is a lot of tech talent, the real estate is quite expensive, but people earn also more and there is really strong technological talent available. We have a technological university quite famous here, then quality of life is also high: the soft factors align as well, but talent availability is certainly a big factor. They also were at the start in an incubator, they made use of that opportunity. The incubator was from TUM (Technical University of Munich), and that also helped.
2. Only time will tell, when you know the topic, and you work in the space you see that the policies that are being developed do not make too much sense. For example: we see rather populist type of policies that look good on the surface, that combine this message of change, but are those the most efficient and economic ways to reach climate targets? I am not so sure. Still, they provide the context everybody has to operate in, but in the end is rather small companies who disrupt the technical dominant space than is currently dominating the system then established players changing the ways they operate. Like when you look at UK or Germany,

they big companies are losing market like crazy, and you have players, new companies who do not have that huge heritage that is lowering them down, that carry on: new companies have much higher degree of freedom, they have different personal they can hire, they do not have that huge structure to disrupt. We take as an assumption that the newer type of companies are kind of from scratch. This is the moment when we will see their rise: the new big corporations of the future are being established today. The startup moment is a very normal part of how the economy goes: Schumpeter's creative destruction is happening now: looking back we will see that this is the moment where the new players of tomorrow will have emerged, you will not refer to them as startups anymore. If you take your average ION worker, they drive their work by the decent salary, your job is secure, you are interested in corporate career, you just don't have to make mistakes. Whereas in startups you can have a rocket career but you work so many hours, you are incentivized with stock options, you have not a high fixed salary, you probably are more purpose driven than security driven, this type of environment normally is driven by smart people and more sensitive ones that will make a change.

3. We mainly use private funds but also tap into European and Bavarian funds too: for European funds we managed to apply by ourselves: we have a general financial advisor, not an expert knowing the different honeypots to tap in when it comes to EU funds. To incentivize startups favorable immigration access to talent is paramount. Cheap housing, access to talent, good universities nearby, tech friendly policies that help you as a funder to get over the difficult first years...is not about public funds you throw at founders, if founders have good idea and you create a business-friendly environment, they will find a way, they will find investors and money. If you set up public money pools that then are being assigned to founders is not the best, the state or public institutions are generally not the best investors in terms of deciding what startup to fund and what not, is not efficient. Professional venture capitalist are much better at this, they will put much more diligence in it since it is their job. The public sphere funds the ones that are good at selling themselves as the greenest but not necessarily the best at it.
4. Munich is not standing out in terms of green innovation I think, on the surface also in my network people are working all over the place. Apple, Google, Amazon are massively investing

in Munich, there are some but I don't think Munich stands out in particular for green, maybe actually...I am not the best person to ask but Berlin is more on fast moving consumer goods and marketing, Hamburg has very strong media focus, Munich is more tech and green tech is a big part of it, but this is a gut feeling of an unformed person.

## **Backacia - FR**

1. The startup was born in 2017 but it has been re-bought because of a legal redress so the two founders are not legally part of the company anymore and there has been a re-organization of those aspects in the following years. So, it was born from the meeting of the two founders: one was from HEC (Paris Business School) and the other from ESTP (Public structures school): they met for working on a project for reducing the pollutants coming from buildings. There was indeed an ecosystem of entrepreneurs around that. There was a network at HEC for entrepreneurs where Backacia was founded, then the team started working at the incubator Station F in Paris. At the time (2017) the market was still not that ready for the re-employment of materials, so they started working on small projects. Then the reuse of materials became more and more popular, most of all after COVID-19. After that there has been a general recognition on the importance of sustainability, that businesses and people have an important impact on the environment in which we live. The pandemics made a sort of an echo in the spirits of people for which they realised that there are issues on which pay attention and the reuse of resources and limitation of pollution is part of that. For the clients we have and the project we work for there is a more and more dense network of architects and engineers that want to engage in recycling. There is also much interest and engagement in those topics by an incoming young generation. But is also true that even older people directing big corporations are more and more interested in such topics, there are some personalities (like in the RSE) that are very concerned by such issues, while before it was more a niche. Also the current context is fostering recycle since the time and money needed for some supplies increased and reuse what you already have is convenient in terms of money, time, transportation and of course pollution. We were among the first startups to do that and then we evolved but around us we saw a growing ecosystem



focused on green development. There are companies like us but many that have the same objectives but act differently, some that de-construct buildings directly, each one has a different offer but we are more and more on the market to offer sustainable solutions. We started working at Ivry sur Seine then we went back to Paris cause it was very expensive, we are now working in an office coworking space. It is nice but I can't take advantage from this environment that much anymore. But the startup is part of different ecosystems like INTEL Partners, for which the team answered to some calls that aimed at sectioning some startups engaged in sustainable development and it was selected. So now the startup is in the database of green startups and we have an easier access to working with some clients. They created a sort of network for green startups.

2. The role of a startup like ours is important but not primary. Startups engaged in energetic supply and reuse are much important. In general terms still, startups role are very important for the decarbonisation aims: institutions come to us but they don't know that much how to do things. Often there is much inertia, while we are a small team and we can act faster and more easily. Also, we are expert in this domain. When instead there are public authorities that are more generalists, they see things under a macro perspective. We can act on our domain with more awareness, and we are more concrete, directly performing solutions. For sure the most important thing under a general perspective is that rules are created and respected, otherwise people won't follow.
3. No we don't use any EU funds. We had some subsidies for a project in Africa from the Fund for Development of the French Government but at the European scale not that I know of.
4. Yes, in Paris there are all the big corporations working and is easy to say that here there is a sustainability-oriented cluster. Paris is surely part of an ecosystem which is stimulating on those issues but is not alone: Lyon is also one and on the re-use of materials also Brussels is strong. London too. In France again there are other spots that are smaller but that are developing like Nantes and Toulouse.

**Sustie - Nor**

1. Sustie was born out of an accelerator called Antler, it's like international accelerator which brings different people together like founders. Inside Antler, we have something called "industry sprints" for which a corporate company came to us. There are like 50 founders there. And they come to us with a problem and we had to solve it in 24 hours, and then we did. Sustie came out of that because this media company "Icarus", an e-commerce company, came to us and presented the sprint. We wanted to go into fashion to make it better tomorrow. And then we created this. So it came up with having three co-founders in our team.

- Interviewer: how did you ended up in Antler?

- Interviewee: They like they do like a lot of scouting. They contact a lot of people. I was contacted by them. I built a few companies in the past and I know how difficult is to find the founders and funds in general, because that's the most difficult when you want to start a company, to find other people who want to do the same thing as you and have the right mindset. In Antler there are like 50 founders, and then you try with one team, something maybe doesn't work, then you try again with another one. And then in this stress situation, you'll find the right team. Antler is like a facilitator, they have business partners who come in and pitch different problems, then you join. So our target were women from 21 to 30ish, mainly based in Northern Europe. Those personas are normally very sustainability-focused people, who are more likely to secondhand shop to buy used stuff. So that's how we went into it. And then of course, we did a lot of user testing in the co working spaces. We went to the universities. Namely University of Oslo. And we did testing at the Oslo Metropolitan University too, to find out the different issuers and stuff. There are a lot of subjects here. And those students also fit perfectly into our user persona, and like them also people in the coworking spaces, because normally it's quite young people. We share with them what they have done so far and they come back with advices maybe. I think people are sensitive to climate change because here in Norway the general population has a higher average standard of living. In other countries the gap between rich and poor is huge. The new generation, or better, Gen-Z and millennials, and of course Gen-X, they are more into second-hand and sustainability, they want things to be sustainable more than cool, or better, sustainable is cool. But they still have the problem with other people on Instagram to

TikTok who share this new fast fashion from China with like 1000 of new products each week. I think it's changing, but prices are still high for new sustainable products like Patagonia. I think that the interest for suitable products comes both from high education and income. And also having economies able to adapt to this new things faster. But other poorer countries will follow, it will just take longer. But in terms of factors that helped the development of Sustie also I have to say that none of us worked in sustainability before, but we all kind of saw how the world is turning in the bad way. We wanted to have an impact.

- Interviewer: if you were in another context, maybe in Italy, or Greece or Spain, do you think you could have been able to create it?

- Interviewee: there's a lot of these accelerators and incubators around Europe too, but to be able to attach it to impact and sustainability... I haven't seen that many investors into that field in southern Europe. But I know even in a lot of these venture capitalist funds in Europe, they now need to report to EU on ESG goals and that's also helping a lot for funding. But Norway is the perfect place to test sustainable solutions because people just have more money. Like this there are also Sweden, Denmark and the United Kingdom, or France, Germany.

2. We are more of a b2c startup in which we try to change consumer's choices. There is a lot of businesses trying to change something. This goes along with education and people trying to look for more sustainable alternative so I think it goes all together. I think that the impact that startups are having on changing citizens' behaviour by offering them sustainable alternatives is bringing a fast change towards sustainability, at least faster than from a public institutions' approach to the problem. Also our solutions by changing consumers' behaviour, they change brands' strategies, as consumers are now willing to go for greener choices and expect greener alternatives also from incumbent large companies. It is the people that you have to change, the consumption and the system are linked. This approach will systematically also lower the prices of sustainable goods and slowly change the systems of production thanks to a different type of demand, they are making better with the worse. There are a lot of services for green now, and if you are impact focused you can apply for EU fundings if you answer to one or more ESGs.

3. No. It takes time to apply for EU funding, it's quite a lot of work. Because sometimes you also need to co-apply for different funds in the European Union, like you have to have a company with you or another partner. Then the grants for European Union can be like 50 million Euros, and you can't do it all by yourself, and maybe you have like 20 or more companies that go together and apply for that. We as Sustie use support from "Innovation Norway", for which funds come from the recycling of plastic. When people give back plastic items like bottles, the money saved from the production from scratch is being invested in innovation projects, and companies can apply. We won because our project actually reduces plastic by offering non-polyester alternatives in fashion.
  
4. Yes, we are part of a green innovative fashion cluster in Norway, which is driving change in the fashion industry. It also helps lots of companies who actually produce clothes to change the supply chain. In general for the formation of a wider ecosystem involving many many actors and institutions takes time, this sustainability agenda from the EU is relatively new. For example the green passport is quite new, meaning tracking all sources of products. This is going to help. There are a lot of other countries that have to adapt. Still there is a lot of good intentions, people are changing because climate change is visible and on the medias, society is moving towards sustainability pretty fast. The nordic countries are quite ahead on this, and I think in 5/6 years all those regulations are going to follow, thanks to the new regulations.

## **SMENA - Swe**

1. SMENA is a spin-off from research from Chalmers University of technology: In Sweden there is a Law that is called "teachers exemption": if a researcher comes up with something during the time at Chalmers the idea and patent falls on the researchers themselves, not on the university. Without it, a lot of good ideas get stuck in the University without being commercialized, because students don't know how to do it. So in Chalmers there are many divisions trying to commercialise what's in the University. Smena is born thanks to the

invention of a student who developed a nano material. He approached one of the commercialization divisions in Chalmers and then they did some work trying to look for potential segments, started a company with some researchers, and went to another division of Chalmers, an incubator called “Chalmers Ventures”, which is actually a Venture Capital Organization. Then they hired a CEO. It was not a problem on which many researchers focused on, but there was this sort of “investigation-materials” process, so the work then focused on finding market segments, and commercializing. It all came up while studying. The Swedish Ecosystem might seem complex but it’s also very nurturing when it comes to commercialize research: there are few incentives trying to promote research going in the industry: they were a part of a cluster of researchers working on 2-D materials, very thin materials, in which researchers try to commercialize their respective researchers, and inventions.

- Interviewer: are there also external people in it?

- Interviewee: Yes, this cluster of researchers on 2-D materials is a Swedish Government program, and there are others like that, trying to promote innovation in the market, providing funding, industry contacts, workshops, free consulting and things like that that help promote researchers, and startups.

- Interviewer: do these programs have special funds or targets for sustainable projects?

- Interviewee: Not as far as I know, not those two in specific. I am not that informed about such processes in Europe but in Sweden in general the sustainability aspect is not a “plus” anymore, is a fundamental: if you don’t approach sustainability with your invention (especially hi-tech) you are not even marketable: sustainability switched from “it’s good if you approach one of the (UN) SDGs” to “if you don’t approach or try to solve an SDG you are not eligible anymore”.

- Interviewer: So if you have to name the main factors that brought SMENA to light what would they be?

- Interviewee: So, researchers are trying to cluster up to enter the market, and this is the biggest challenge. There is a lack of industry engagement early on, they are expecting more mature solutions from start-ups. But in general, the industry appreciates and seeks innovation. Four factors would be: the strategic help group, the knowledge environment around Chalmers, the structures for research around the University, the dedicated Capital Venture firm they have, the innovation office. It goes: research, innovation office, Chalmers Ventures. And that's very good, since they make the transition easy. Another important factor is that there is quite a lot of access to governmental fundings, there are whole bunch of different funds, accelerators, innovation offices even for early stage ventures. The business climate here in the Gothenburg region where I work also is very non-hierarchical, is not hard to scale-up. Influential people are willing to discuss new ideas. Sometimes not as much as we wish for, but I guess it's good.

2. We could be the main actors, but you need market traction. We provide materials to electolise the companies, for example in heavy industry, so we need the help of large companies to gain credibility, also for funding. The change has to be requested by the industry.

3 We mainly use public funds. We also applied for an EU fund with another team but is our first application and we are still waiting the answer.

4. Sustainability is ingrained in the R&I system in Sweden , we do not call it green anymore, it is so fundamental that is a demand at this point. We are looking in the different hydrogen in Europe and Europe is taking good steps in the right direction.

- Interviewer: do you see any hotspot in this?

- Interviewee: We have seen Spain, south of France who are innovating a lot in this sense (on hydrogen). Japan, Indonesia, South Korea and China, Australia also have very ambitious plans in utilizing hydrogen. In Sweden there is a synergic environment on green innovation, we don't even call it green anymore. Giving importance to sustainability is something engrained in the priorities of the companies even before laws on emission were created. Sustainability is something engrained in everyday life, it is generally appreciated that you buy eco-friendly things, people bike, is something broader, in the culture of Sweden.

## **Mosa Meat, Ned**

1. The “godfather” of cultured meat is a dutch professor who initiated research in the field and made the first milestone steps. Hence, the dutch environment in the 2000s was more favourable to the research in other countries, for which the government offered a research grant of few years (around 8) in which Dr. Mark Post was involved. At the end of this research period, in 2010, some people decided to keep pursuing this out of scientific interest but also of animal welfare and environmental concern. 7 years later, our company, so, Mosa Meat, was born as part of the university, and with its growth it has slowly been detaching and becoming its own entity. So there was certainly and market gap to be created, consumer interest, but also research interest and support from the university.
2. I think that at this point the impact of Mosa Meat is limited as it is still in the development phase. Still, when looking at the long term, however, the goal is to replace a significant portion of beef in supermarkets with cultivated beef, and at that point the impact will be big. We are able to change consumption of meat and therefore the habits of people.
3. No, in our case investments from private stakeholders play a huge role.

4. Well, I would say yes, even if not precisely geographically, in the sense that it is a global movement. Just this week there was a conference on cultured meat, where one can see the blooming and world-wide expansion of this field. It is a movement of researchers and startup, working together towards a mission. Hotspots for this are in Europe, mainly in the north, but also in the U.S. Japan and Singapore, as well as a few other countries.

## **Emitwise - UK**

1. It may sound cheesy but me and my cofounders we were very sensitive to climate change from an early age, we had a good education in which there was this really good science teacher that explained us the mechanisms of global warming. Before starting the company, me and these friends we were all living together and we really wanted to do something about it, we used to talk about the different solutions to overcome climate change, and we thought there was this big gap around helping companies find profitable ways to decarbonize. So, the reasons behind the founding are that as a founding team we were very passionate but also because we saw that there was a pretty significant gap in the market that if it didn't get addressed then companies wouldn't be able to transition to be sustainable.
2. The power-holder for going net zero are surely institutions, In EU CDP scores<sup>2</sup>, most EU corporates are improving in sustainability and in the US not, and that's because in EU there are requirements telling companies that they have to be serious about it. CSRD demands that corporates have a good carbon reporting, and they need a good Carbon accounting company,

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<sup>2</sup> A CDP score is a snapshot of a company's environmental disclosure and performance. Our scoring methodology is fully aligned with regulatory boards and standards, and provides comparability in the market. Disclosure in 2022. Guidance for companies (cdp.net)



but without the demand it's hard to expect things to change a lot. Let's say institutions create the demand, and us we create the answer to that.

3. No we haven't take ant EU money at all. We actually looked for it, but when we started feudalizing, the cost of capital was so low that it was a cheaper and faster alternative to grant money, today getting money from investors is a bit harder so getting grant money would be much more important.

4. yes and no: when we started the company we had London headquarters, but also I had experience starting another startup in silicon valley around ST Francisco, and I would say that that's the context that most benefitted Emitwise and in my opinion sometimes some of these green clusters or accelerator or ecosystems can be a bit damaging: my personal view is that: the most important thing around sustainability is to make it profitable, for it to align with how capitalism works today, because like it or not that's how the world runs. Companies need to make money and that's how you help cut carbon. Silicon Valley is a money-making machine and the fact that we had access to investors, advisors and people that built companies in Silicon Valley meant we able to take our vision to create our sustainability technologies but do it with that sort of foundation. Whereas when we spoke with some of the ecosystems, of the accelerators in the UK and Europe that were more sustainability-focused, it felt a lot more like charity creators and not business creators, they are very focused on the impact but not focused on how can you actually drive profitability.

## **Ecolytiq - UK**

1. Ecolytiq was founded in March 2020 by 6 co-founders, active in the area of payment, banking, data science, transactions, from the banking perspective and not environmental perspective. The idea was actually born in 2016 by our co-founder who was active in fraud detection for payment providers, so the idea was to link that with carbon footprint, because carbon foot

printing became big in 2016-2017 and there was always only a link to company emission, on an industry level, but not on an individual level. So he saw kind of a gap there, a business opportunity, not only from an economic perspective but also from an environmental perspective, we are always talking about changing industries, but we are, on a political level, only rarely talking tackling individual behavioral change: this is what he wanted to change with Ecolytiq. This is what he wanted to do: change human behavior and do good for the environment. Of course we have investors, we couldn't do business without making money out of it, we have to create real value propositions to banks: there are some banks that are really interested in that environmental focus, in that effect on behavioral change, but there are also other banks that are only looking at business cases, so we have to serve both. This is a slightly limitation that we have, so we have to serve our investors and make money, on the other hand our business does not work if we don't change human behavior: I would say that this is the ultimate goal, to contribute to positive development in Europe or Worldwide (as we are acting worldwide now with Visa). What helped us a lot is that climate crisis is increasing and political decisions bring companies to tackle the issue more and more, there are no strict regulations on that but there is a political will to go in that direction and most of all a general consumers' awareness on climate change: why are banks doing this? Because consumers are asking for it. As we are linking carbon footprint to spending data, you can see your whole carbon footprint, we want to engage indeed the costumer, we also offer carbon offsets.

- Interviewer: Did your education had an impact on your interest in sustainability?

- Interviewee: Well, I studied business administration and economics, but we had the opportunity, at my University, to spend 25% of the time doing a very different subject that we could choose, independently from business administration. So I decided to do sustainability studies. I totally loved my studies as they had economics, business and also sustainability.

2. Overall, of course, ecolytiq contributes to a Net Zero Economy and to achieving the overarching goals of the EU Green Deal, namely to gradually reduce CO2 emissions over the next few years. However, we are taking a different approach to what the politicians are proposing. Whether green startups in general play a big role in the implementation of the EU Green Deal is not something I can judge well, as on the one hand I am not sufficiently familiar with the content of the EU Green Deal itself, and on the other hand I do not have a good enough overview of the different business models of other startups outside the fintech / banking industry. In general,

however, I definitely see startups as drivers of innovation and I am convinced that there must always be both - big companies that change and small startups that try to implement visionary ideas, even if they sometimes fail.

3. We do not use any governmental funds, nor European funds. We are funded by VC from different stakeholders, we have different business angels. Many companies are not funded by EU funds, but I think there is a reason behind, I mean, there were few companies doing private carbon foot printing stuff, so I think the EU couldn't know in 2017 or 18 when all those funds have been initiated the EU did not know that such a business model could evolve one day, and so those small companies are probably not in their target I would say. But on the other hand, I could imagine that in this vision if a business or a company can prove that it has a good impact on reducing carbon emission, for example, it could apply for such funds, this could be a great idea. By proving your good effects you should have access or apply to some funds, that would be a great idea.

- Interviewer: By business model you mean “sustainable-focused business models”?

- Interviewee: Yes, for example companies cutting CO2 emissions from individuals or companies: if you can prove that and get in contact with the EU this could be a very nice thing to accelerate, to bring funds to the right companies.

4. Yes, we have a lot of partners that are doing similar things, I see that our business environment is quite rich. Industry-wise the carbon accounting banking and behavioral change businesses is a growing sector. Then in terms of cluster, I for example I am based in Hamburg but the startup was born in Berlin when our 6 cofounders lived there - they were 6 friends, now they are more or less 35 years old- but our partners are spread all over the globe. I think every continent except Africa has green innovation hotspots, actually no, in South Africa maybe there is a lot of great opportunity arising, but it's more of a digital green innovation dynamic ours, we were born in Berlin but growing internationally, also in North America.

## **Biophilica – UK**

1. I had my daughter in 2013, coupled with watching and discussing a lot of news. You really start to think about the future and on how scary it is. But if I have to think about the factors that helped its growth in practical terms I would name our accelerators (Sustainable Ventures, Fashion for Good, Circular Factory), our investors, namely Rhapsody, Sustainable Ventures, BRAN, Queen Mary University, and many other small investors. Also grants from the UK and the Netherlands were important for that: we have been fortunate to receive several UK and two dutch grants which have helped us immensely. And then...last but definitely not least: the amazing Biophilica team.
2. A large part. The companies that can do the most with the least will be successful this century. It's also important to note that large existing corporations play a large part in quickly transforming to conserve our shared resources too.
3. Not yet, but we hope we could have access to those in the future.
4. Yes, we are part of Fashion for Good, Sustainable Ventures, Circular Factory, and a few other organizations that actually form a nice sustainability-focused ecosystem.

## **Humbee - Ned**

1. Humbee was born because our CEO ordered takeaway and he noticed the share amount of plastic that came with. He thought that it was a horrible status quo and that doing things in a more sustainable manner was possible, so why not giving people the option of not using plastic. If you order takeaway, even if you look for a more sustainable solution, very often you are "locked in plastic", and not only consumers but also restaurants when looking for more sustainable alternatives don't really know how. There was a gap in the market, like parts of a puzzle that for which many actors have a part of the solution, but they were not connected in a

network that brought those solutions around easily. He [the CEO] was coming from a background in business & entrepreneurship, and needed a more sustainability-focused expert, so he called me. Then in terms of factors, one of the things that enabled the company from becoming reality is innovation funds. In Netherlands there is funding body MKBIDEE<sup>3</sup>, which is a network that gets together all of these innovative ideas: you can apply to it, picture your idea, put it forward and they provide funds. It like a competition, they give different amount of funds. It is an innovation funding network, they are different bodies put together, the government is part of this, and the main idea is to support innovation, a sort of incubator, a multi-sectoral innovation hub. So we got some fundings from there to get off the ground. Then, we raised capital from investors as well, so we got funding from different sources in order to start-up. We are launching this year, and that opens up the need to find new investors because tech-companies have to survive. We must scale in order to grow. Then several factors come into play from different directions the Netherlands is really a hotspot for innovation especially in technology and engineering. We have been a pioneer on this in many different aspects, for decades. You have not just innovating companies but also the groundwork of universities such as the TU Delft which create people who like to innovate, that's it! So Universities like TU Delft, or TU Eindhoven and Rotterdam Management School, really have innovation and business focused education: you have a bunch of young people growing up and getting educated in an environment which is like: what is the next best idea? This is true especially for technology and engineering. And I can tell you this because even us as Humbee we are trying to hire a chief technical officer, and it's a challenge because and everybody who finishes their programming masters they start creating their own startups to implement innovation. Of course, not every startup will be successful, but everyone is taking a shot! This is because innovation

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<sup>3</sup> “MKB!dee is an initiative of the Dutch ministry of Economic Affairs to promote the development of experimental approaches for (and by) lifelong learning in small and medium sized enterprises. The programme is implemented by the Dutch national STEM platform (PTvT) in cooperation with the Dutch Enterprise Agency (RVO) and provides support and funding (up to 200.000 per project) to SME's for the development of new approaches” (EuStemCoalition.eu, from <https://www.stemcoalition.eu/programmes/mkbdee>)

funds are there, the environment in general is focused on innovation: some of them work, some of them don't, but the environment is an incubator itself.

2. The flexibility and the capacity for smaller entities and startups to implement solutions very quickly is really part of their added value to society and to broader sustainability goals, simply we do not have red tape: if I tell the rest of the team "today we are going to be zero waste" it shall be done, nobody is going to put that on vote from a committee and so on. We can make changes; we can adapt very fast. If something is not working, we take it away. We can be very quick, experimental. We can try and we can fail with very little consequences. But large entities like governments, city halls are much slower: nothing can be done because someone said so. There are longer processes, if things could change immediately, it would be dangerous for sure, but this means that large corporations and organisations take time to implement changes, they are slow, and when they change something their effects trickle into everybody's life quickly, while smaller companies are always pushing a rock up a hill, we don't have this huge infrastructure supporting us but neither that much responsibility and coordination efforts. That innovation that green startups provide and experiment is almost like a torch as well, sometimes big entities are like slow to adapt because they are like: "I don't know if this will work or not", but if they see that a startup made it work then they could. So, if startups show that something works, they prove to the larger picture that something is actually possible, we show that there is demand for that. That's one of the roles of startups: to prove that things can work, to do that quickly and to be experimental, finding new pathways. There needs to be some top-down things, some bottom-up and some in the middle, you need collaborative processes. Humbee works with restaurants, and they want to be more sustainable, not just for the environment but also for your pocketbook because if you consume less energy you pay less energy bills, and so on. However, sometimes this change requires some investments, an restaurants are in an industry that has thin margins. So, restaurant face financial hesitation in prioritizing sustainability, and the legislation has to support, to push for these changes, to invite for that but giving a target and the time to switch, just like we switched pollution for cars. So there can be the people that are innovating that say: "hey! There is what you were looking for!", and the person that has to change will be like: "yes but it costs money to switch, I have other expenses and other priorities at the moment" and this is where bigger bodies are like: "ok, you have 5

years to face these costs, and you must". So, everybody is putting something in. You need the government to make better rules, to push, it's not that people don't want, it's because it requires expertise, it is difficult. This is not just about making a fancy presentation for the European commission, this is about putting food to put people's table, often they really don't have the money for those changes. So everybody has their part to play. So two things that institutions can do are: A. set those rules, B. make it easier. Which they do, with subsidizing, on a governmental level, which cooperates of course with the European Union. One hand a lot of it is just political rhetoric to sound good, on the EU level or below: there is not the understanding of how this is translated on the ground, it is important what the EU does, but you should turn your eyes on the local context to see what is actually been done: the municipal level knows a lot better what the challenges are, what is the situation of a city, what is possible or necessary. Whereas someone sit in Brussels says: "all cities need to switch to this "but what is possible in London might not be possible in Athens. You need to have this consideration of differences. Europe is trying to make pathways for this much bigger goal of becoming carbon neutral, but the implementation happens to the local level, so it should be important to give enough power to the people who understand the unique circumstances that there are in certain location. It's important to give power to local politics and geography. It can't happen all at the same time and in the same way just because someone in Brussels said so. People are doing things, and we need to support them, you need innovation, you need to support crazy ideas to make changes.

3. No, we do not use any European funds at this moment, maybe it will change. Humbee is a private company, and all equity is private. We try to grow it organically me and the founder, as we don't want to forget why we were born for the sake of scaling up and aiming for money. There are many who are just focused on profit and expansion that they forget why they were founded, they "sell" their principles and main guidelines for gaining more funds. If we will find the necessity to cope with all the strings from European funds application we will, but for the moment our growth is in our hands. It is possible that those rules might modify our idea of Humbee, we don't know. We want to grow as we like, this does not mean that the EU would change us, maybe not, but we didn't even looked at those funds. Part of our goals is to give back what we got, in terms of food social benefits, we work with food banks a social kitchen.

When you are beholden to shareholders that don't necessarily share your decisions then you have to follow their rules.

4. Yes I feel part of that. Simply based of just the geography: two months ago was in the Impact Fest 2022 in the Hague and it was amazing, it's this giant, massive hub, with innovators, companies, larger companies coming together, consultancies firms, startups, venture capitalists, municipalities, coming to discuss and brainstorm collectively in a broad arena of industries, sharing best practices, what is happening in a city, in another and so on. Such conferences are normal, Impact Fest is annual and big, there were thousands of people. They also have their funding, they run like a little competition beforehand with different proposal from startups 10 thousand euros here, 120k there, to put into ideas. These are not just people in the innovation field, they go to COP23, it is very broad. It is also connecting to other hubs, to ideas going on in Africa, USA, Asia and so on. So, it is a hub but it's a connected hub, it is a vibrant, alive hub, a lot of people who have a lot of ideas on how to shape the world, but they do not have just the idea, but the action that must be taken, concrete actions: money and legislation. It is really great to have ideas, but if you have an idea and leave it there it is useless. You need to have a software, programmers, money for having them, partners, collaboration. You need support from infrastructure, structure, legislation. Tangibility is important; you need partnership, money, support, nothing happens in a vacuum. People together can create amazing things. The fact that here in the Netherlands everybody cycles is because we have infrastructures to do that, people grow up doing that from school, it's not that others want to pollute: they need the tools, the alternatives not to. Startups can provide that but within a legal framework that leads people to adopt them. I think knowledge holding is knowledge wasted. As long as we don't get caught up in politics: politics often squabbles, and it's such a waste of time when we could be innovating and pioneering things not just for our country but for the human race. Because if everybody's life on earth is better, all the world is better.



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