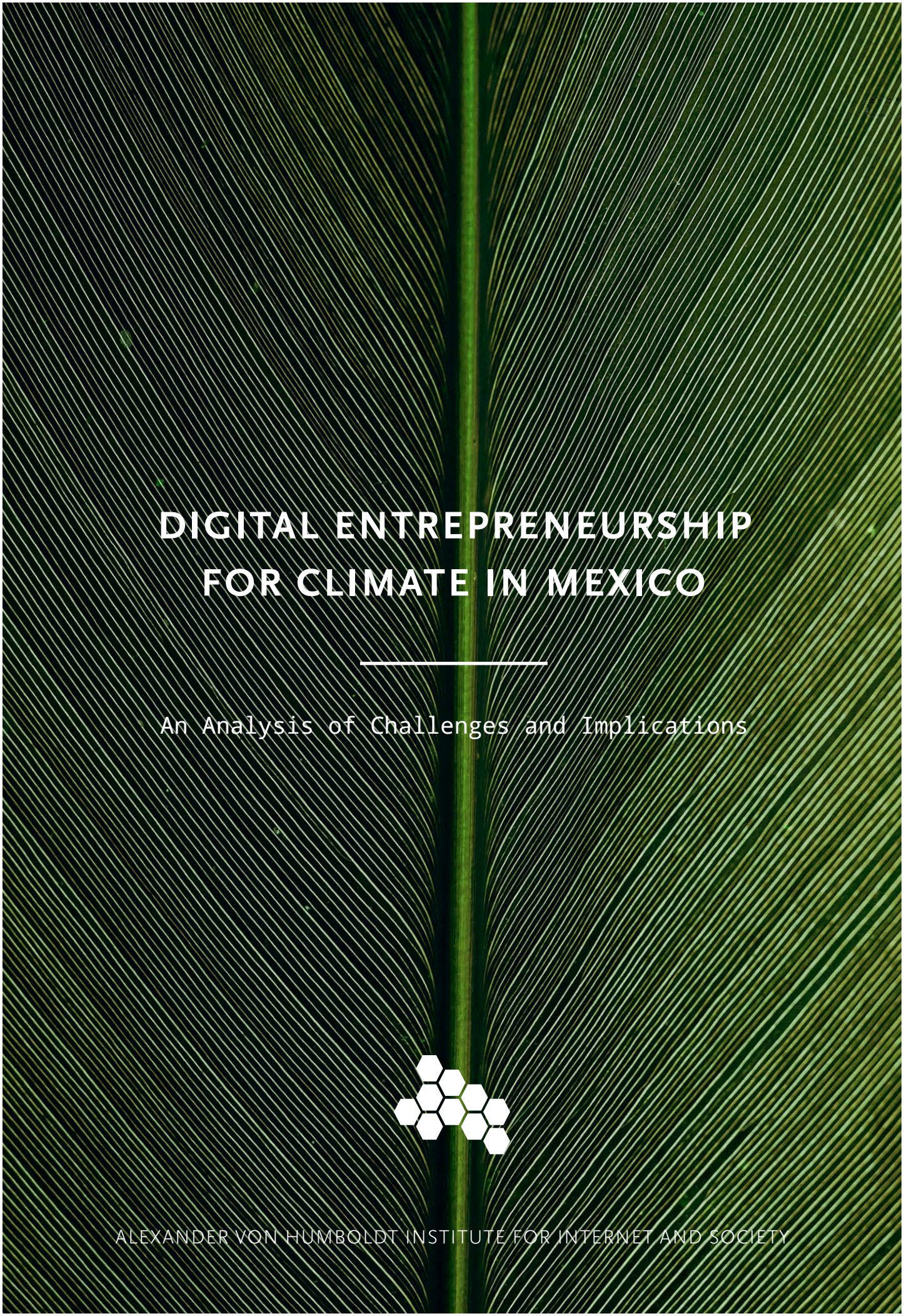

DIGITAL ENTREPRENEURSHIP FOR CLIMATE IN MEXICO

An Analysis of Challenges and Implications

ALEXANDER VON HUMBOLDT INSTITUTE FOR INTERNET AND SOCIETY

DIGITAL ENTREPRENEURSHIP FOR CLIMATE IN MEXICO: AN ANALYSIS OF CHALLENGES AND IMPLICATIONS

REPORT

Alexander von Humboldt Institute for Internet and Society

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SUSTAINABILITY, ENTREPRENEURSHIP
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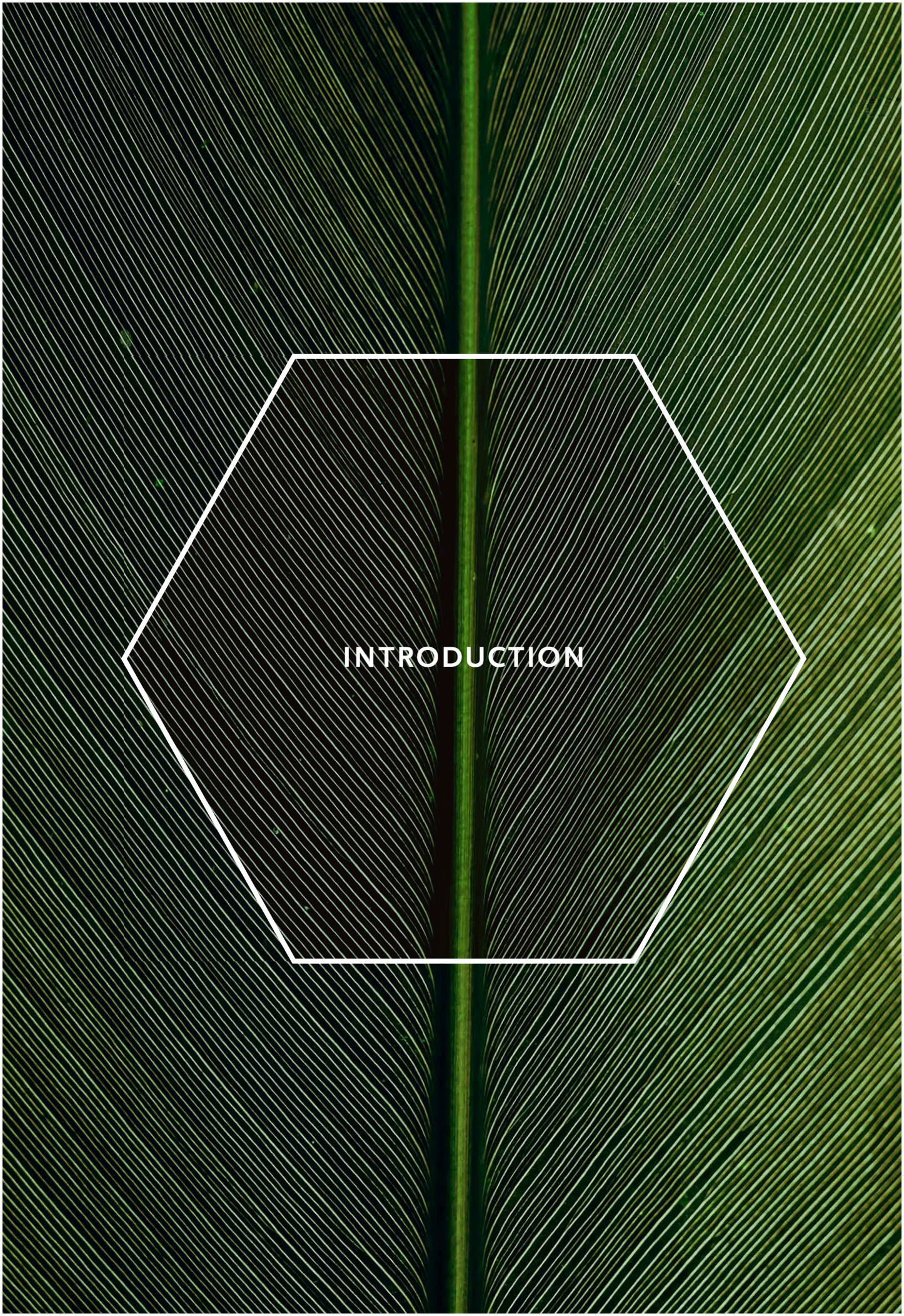

INTRODUCTION

Climate change is a global phenomenon with far-reaching environmental effects such as heatwaves, melting polar ice and declining biodiversity. Depending on where people live, they will experience climate change differently. Mexico is especially threatened by droughts, biodiversity loss, forest fires, rising sea levels, floods and increased air pollutants. Collectively, these environmental impacts could have disastrous consequences for its ecosystem, economy and population, which is why immediate and drastic measures are needed to adapt to climate change by building resiliency and to mitigate climate change by reducing emissions and transitioning to clean energy (IPCC, 2022).

The deployment of digital technologies is central to the measures to mitigate climate change (WEF, 2022). Digital technologies encompass a wide range of technologies, from internet and satellite imagery, to apps and cloud computing, to advanced developments in artificial intelligence (AI) and blockchain. These technologies can be used for climate change mitigation and adaptation, disaster risk management and environmental sustainability. To take just one example, AI could be leveraged for low-carbon electricity by improving forecasting of supply and demand to optimise the energy mix as well as reducing the current system's impacts by cutting fossil fuel emissions (e.g. through pipeline maintenance) and reducing system waste (e.g. through grid updates) (Rolnick et al., 2022). However, digital technologies can also cause rebound effects such as increases in energy use associated with powering data centres and the consumption of rare materials to produce digital devices (D4S, 2022).

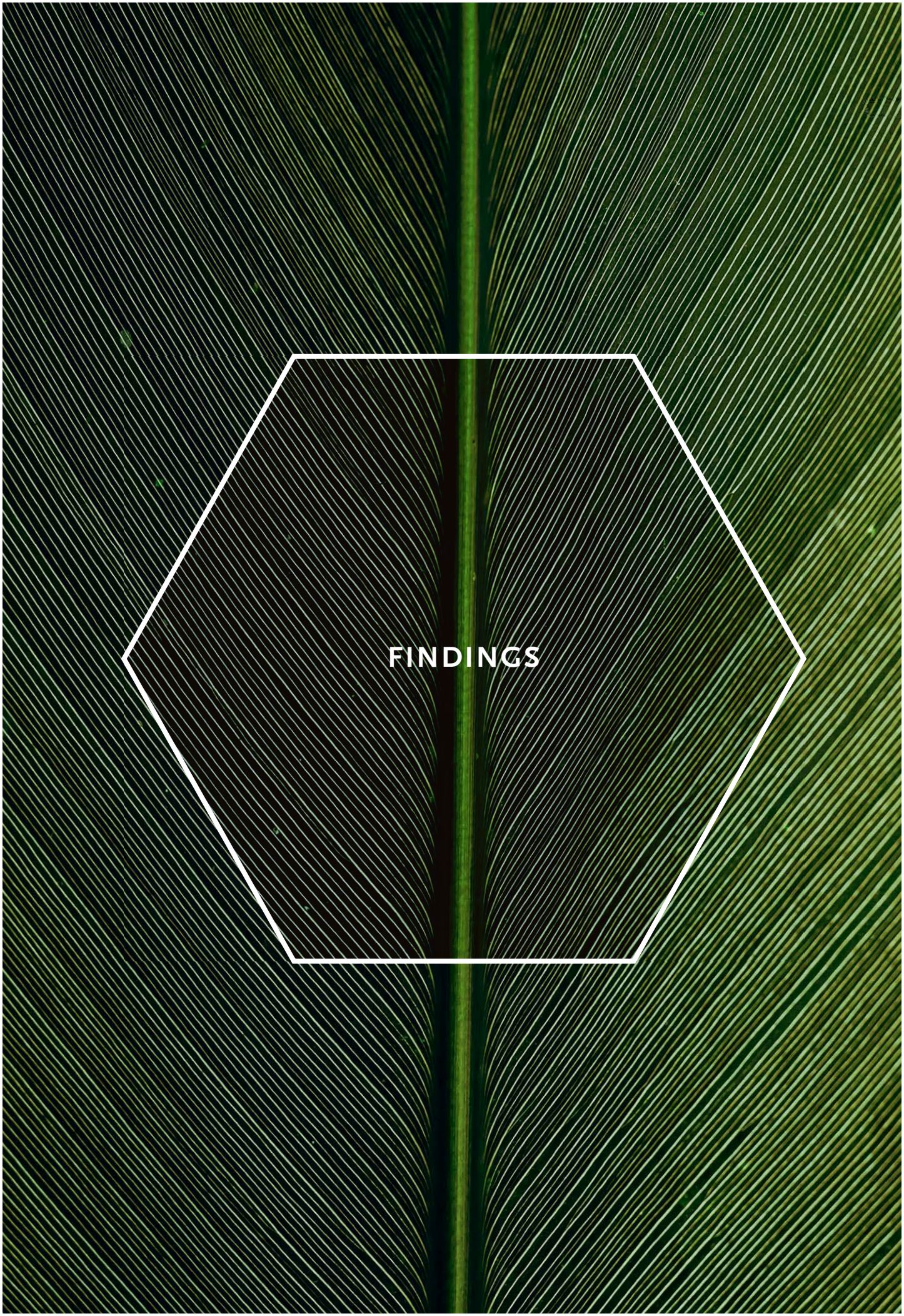
THE DEPLOYMENT OF DIGITAL TECHNOLOGIES IS CENTRAL TO THE MEASURES TO MITIGATE CLIMATE CHANGE

Digital entrepreneurs could play an important role for the design, development and deployment of digital solutions such as AI to adapt to and mitigate climate change (Siebold et al., 2022). In contrast to larger corporations, they face fewer organisational barriers such as low managerial priority for environmental issues and reluctance to change. They are also less constrained by hierarchy, bureaucracy and the status quo; startups tend to focus on creating new products, services and markets, and to see opportunities in challenges (Embry et al., 2019). Engaging in digital entrepreneurship is not easy, however. In fact, 75% of startups in Mexico fail after only two years (Medrano et al., 2017). It is therefore crucial to analyse and understand the challenges that digital entrepreneurs face, especially when designing solutions to address climate change and other sustainable development goals. This raises the question: What can be done to promote digital climate startups in Mexico, and what obstacles do entrepreneurs currently face?

To find answers to this question, the Alexander von Humboldt Institute for Internet and Society (HIIG) organised a research sprint in collaboration with the Digital Transformation Center (DTC) Mexico, as part of the research project "Sustainability, Entrepreneurship and Global Digital Transformation" (SET), which is funded by the German Agency for International Cooperation (GIZ) on behalf of the German Federal Ministry for Economic Cooperation and Development.

THE RESEARCH SPRINT: BACKGROUND AND APPROACH

The research sprint "Green Technology, Entrepreneurship & Climate" brought together 11 international and interdisciplinary fellows to study the barriers to digital entrepreneurship in the green tech sectors of Mexico and Vietnam. From 11 October to 23 November 2022, the fellows collaborated online and received guidance from senior researchers at the HIIG on topics such as digital entrepreneurship and sustainability as well as on conducting impact-oriented research. From 23–30 November 2022, the fellows then travelled to Vietnam for one week to discuss their initial findings with Vietnamese stakeholders. On 13 February 2023, two of the sprint's research fellows, Paul Vilchez and Regina Cervera, presented the results of the sprint regarding Mexico during a multi-stakeholder dialogue in Mexico City and discussed them with key stakeholders from the sustainability and digital entrepreneurship ecosystems. This report summarises the sprint's core findings. It is based on a review of prior literature, interviews conducted by the fellows with representatives of the Mexican sustainable entrepreneurship ecosystem, and the discussions at the multi-stakeholder dialogue.


FINDINGS

The fellows identified a range of factors that inhibit digital climate entrepreneurship for climate in Mexico. For clarity and readability, these factors have been organised into four broad categories, namely economic, institutional, social and technological challenges. Note that the identified factors do not necessarily represent an exhaustive list of the challenges that digital entrepreneurs face. Moreover, some of the challenges could arguably apply to different or across several categories. These challenges are framed below as opportunities for Mexican policymakers, because addressing these challenges could help to improve the conditions for digital entrepreneurs and startups in Mexico.

ECONOMIC CHALLENGES

The fellows identified two key economic challenges: creating and promoting attractive financing sources as well as transforming economic sectors consisting of small and medium producers in an inclusive way.

THE NUMBER OF DIGITAL STARTUPS WITH A FOCUS ON CLIMATE AND SUSTAINABILITY THAT MAKE IT TO MARKET IS STILL QUITE SMALL

First, even though the Mexican startup market has been growing in investment and importance within the Latin American and North American regions (PwC, 2021), the number of digital startups with a focus on climate and sustainability that make it to market is still quite small (Statista, 2022). For instance, the aforementioned study showed that, from the 452 identified startups, only 2.4% had products and services that address energy and the environment; while another 2.4% and 3.1% offered solutions in food technology and transportation respectively. Altogether, these are important sectors for climate action. In comparison to the 25.6% made up of financial technology startups (also known as Fintech) and software startups, investors are obviously not as keen on investing in sustainable or climate-related enterprises. Because entrepreneurs are often dependent on large capital investments for a strong technology base (van Rijnsoever, 2022), the insufficient availability of high-level funding becomes a challenge for digital startups in Mexico, especially those tackling climate change. This is the result, in part, of the limited normative incentives from the government (PwC, 2021); tax and economic stimulus would redirect investment to this sector (Ye et al., 2020)

Second, many of the important transformations need to happen in sectors characterised by small producers and businesses. For instance, in agriculture, 54% of food production comes from small-scale producers (up to 0.2 hectares of irrigated land and up to 5 hectares of rainfed land; Secretaria de Agricultura y Desarrollo Rural, 2020). How to transfer innovation in these sectors is challenging, because producers typically do not prioritise sustainability in business operations and also often lack the financial resources needed for the large investment often associated with digital technologies (van Rijnsoever, 2022). Moreover, digital technologies have previously been identified as exclusive, and that could broaden inequalities (Satalkina & Steiner, 2020). Due to Mexico's social characteristics, its digital divide could be even greater in this respect (García Sandoval et al., 2020).

INSTITUTIONAL CHALLENGES

Next, the fellows identified three major institutional challenges: easing legal and bureaucratic burdens, expanding governmental support and implementing a holistic action plan to address digital and sustainable transformation.

First, prior to the research sprint it had been clear that the legal and bureaucratic processes demand many resources from entrepreneurs in Mexico. For instance, a previous study calculated that Mexican companies spend on average 346 hours per year on tax declarations. In comparison, companies in countries like Norway spend only about 87 hours on similar tasks (Gallegos et al., 2014, as cited in Medrano et al., 2017). The same study also found that enforcing contracts takes up to 400 days in the Mexican legal system and can amount to 31% of the claim; in countries like Singapore, this can take half the time. The bureaucratic flaws in terms of resources and legal protection can discourage entrepreneurs from starting new businesses and investing in new ideas, services or technologies. Bureaucratic barriers and costs are key impediments for startups in the Global South (Doruk & Söylemezoğlu, 2014), and easing these burdens would spur on the creation and support the survival of startups.

THE LEGAL AND BUREAUCRATIC PROCESSES DEMAND MANY RESOURCES FROM ENTREPRENEURS IN MEXICO

Second, digital and sustainable startups benefit greatly from and often rely on policy support (Ye et al., 2020). This is largely due to the high investments, the novelty of the markets and the perception of risks associated with them, as well as the system needs in terms of connectivity and circularity (e.g. van Rijnsoever, 2022). Similarly, sustainable products often cannot compete in such markets, due to market irregularities and a prevalence for people to not perceive their relevance (Li & Zhong, 2017; Tiba et al., 2021). In this regard, it is a challenge for Mexico to expand governmental support with new programmes and policies. For instance, the National Institute of the Entrepreneur (INADEM for its Spanish acronym) was closed down in 2019 (PwC, 2021). As the only governmental and nationwide centre for entrepreneurship, its closing demonstrated a lack of support for the startup ecosystem, especially to those in rural areas that have less access to other forms of mentorship and financing. Surprisingly, the number of startups has been reportedly on the rise during the last few years despite the circumstances (PwC, 2021). Still, we should expect a more organised and inclusive startup ecosystem if national and regional governments were to take a more active role in creating institutions to support the development of these new and transformed economic sectors.

Furthermore, Mexico has shown its commitment to addressing climate change by recently revising their nationally determined contributions (INECC & SEMARNAT, 2022). It still lacks an action plan, however (OLAC, 2023). The fellows' research suggests that incorporating entrepreneurship into this plan would help achieve the stated national goals. For instance, some of the solutions mapped have the potential to significantly increase efficiency in energy and resource intake for industries in agriculture and transportation, as has also been suggested by the World Economic Forum (2022). This nonetheless requires a broad plan that includes various economic sectors and support from many different organisations by incorporating sustainable and digital components in education, the economy, and even trying new forms of legislation (e.g. van der Waal et al., 2020).

SOCIAL CHALLENGES

In Mexico, the social challenges of scaling digital entrepreneurship for the climate lie in two main categories: fostering equal opportunities by advancing a culture of entrepreneurship and digital literacy.

Promoting a culture of entrepreneurship among historically marginalised and vulnerable groups is a significant social challenge in the context of digital entrepreneurship that focuses on climate action in Mexico. Women, who run about 25% of all businesses and 28% of microenterprises in Mexico, face significant hurdles to access entrepreneurial opportunities. Moreover, the indigenous population in rural areas is among the groups that face the greatest obstacles in accessing information and communication technologies (INMUJERES, 2013), which can limit their ability to engage in digital entrepreneurship for the climate. Additionally, public insecurity is a major concern for 40% of Mexican small and medium-sized enterprises (SMEs) looking to expand their activities in certain regions (Economist Impact, 2020). Finally, disparities in education between high-income and low-income households further contribute to unequal access to entrepreneurial opportunities (Kiyosaki, 2013).

PROMOTING A CULTURE OF ENTREPRENEURSHIP AMONG HISTORICALLY MARGINALISED AND VULNERABLE GROUPS IS A SIGNIFICANT SOCIAL CHALLENGE

Developing digital capacity building with a special focus on small producers and rural areas has the power to promote digital entrepreneurship to tackle social challenges related to climate change in Mexico. However, a significant portion of the Mexican adult population lacks basic digital skills. According to the OECD (2019), almost 40% of Mexican adults need to strengthen their basic digital skills. Likewise, there is a need to advance digital literacy among small producers and the agricultural sector in Mexico, where only 33.4% of producers use the internet, and only 9.6% make productive use of it (C Minds, 2020). Moreover, Mexican companies tend to use relatively basic digital tools (CEPAL, 2021), which hinders technological innovation. Additionally, although 93% of SMEs see technology as a way to grow their business, they often lack knowledge about which tools to use (Fundación Capital, 2020). This lack of knowledge and capacity in digital entrepreneurship limits small producers' and rural areas[1] ability to engage in sustainable and climate-friendly entrepreneurship activities, which as the climate does change will exacerbate social and economic inequality.

1 While the purpose of the sprint was not to map green and digital solutions, the fellows researched online databases, such as startupblink.com and crunchbase.com, as well as sector-specific reports to get an overview of the current state of the startups ecosystem as it relates to green technologies.

TECHNOLOGICAL CHALLENGES

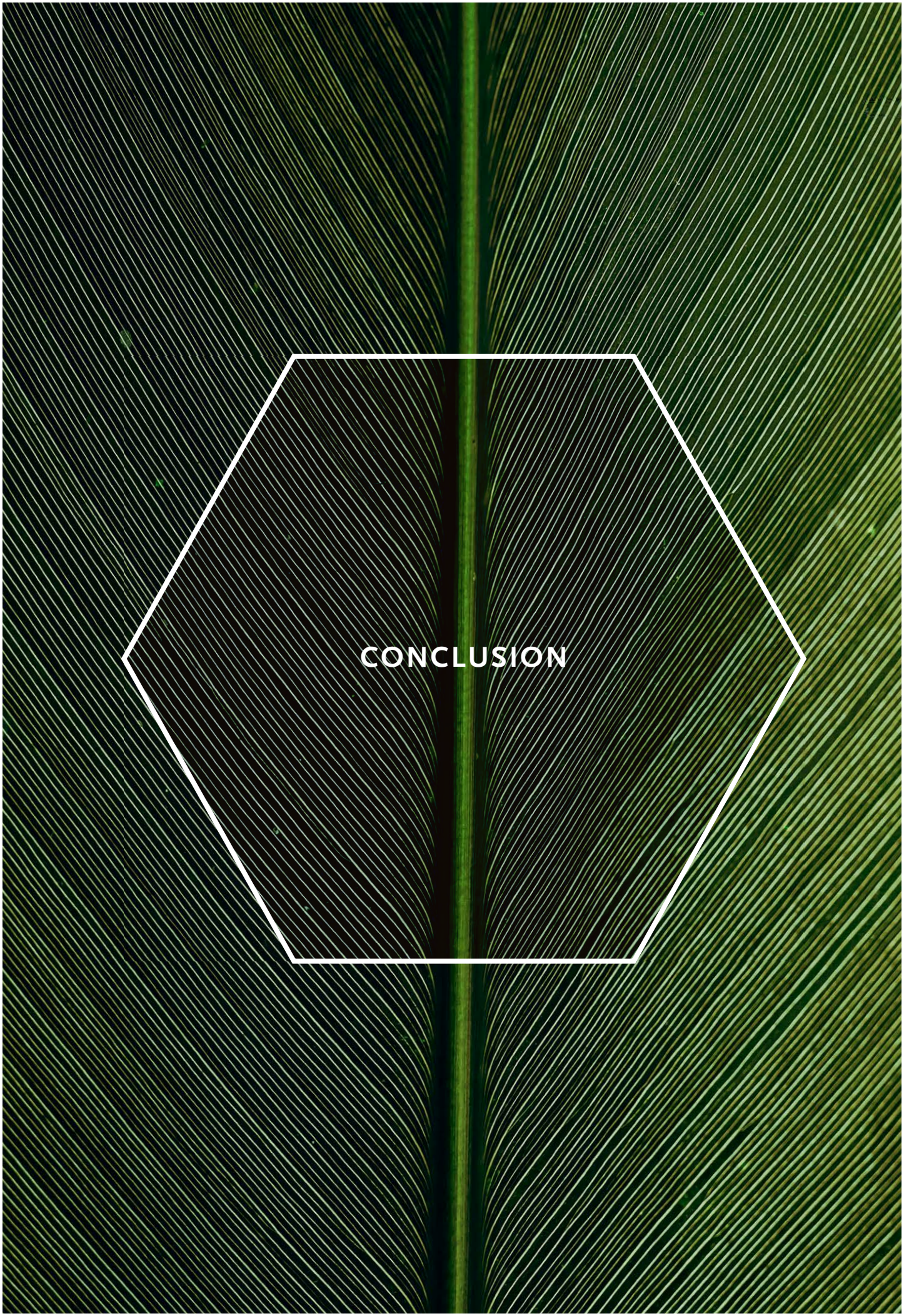
The technological challenges for digital entrepreneurship in Mexico can be summarised into: minimising the digital divide and mitigating digital technologies' environmental impacts.

Reducing the digital divide by increasing internet connectivity and access throughout the country, especially in rural communities, is a significant technological impediment to digital entrepreneurship in Mexico. A considerable portion of the Mexican population lacks access to the internet, with around 5.4 million inhabitants without internet coverage (SICT, 2023). The digital divide is particularly stark in rural areas, where 43.5% of the population does not use the internet, more than double the urban divide (which itself is a significant 18.4%; IFT, 2021). The lack of internet connectivity and access in rural areas can hinder the adoption of digital technologies and limit the ability of small producers and rural entrepreneurs to engage in sustainable and climate-friendly entrepreneurship activities that tackle local challenges. This, in turn, can perpetuate economic and social inequality and exacerbate the impact of climate change on vulnerable communities.

THE LACK OF INTERNET CONNECTIVITY AND ACCESS IN RURAL AREAS CAN HINDER THE ADOPTION OF DIGITAL TECHNOLOGIES

The three economic sectors mentioned above (agriculture, transport and energy) can benefit greatly from the use of digital and emergent technologies to mitigate each sectors' environmental impacts, such as energy consumption and the emissions associated. Promoting digital entrepreneurship has the potential to develop new and innovative solutions for climate change mitigation. Oil and gas are the primary sources of energy in Mexico, with oil alone accounting for nearly half of the total energy mix. Mexico's electricity sector is experiencing rapid growth, however, with demand increasing at an average rate of 1.6% annually since 2000 (IEA, 2020). The main source of electricity in the country is natural gas, much of which is imported from the United States as prices are low in North America.

For energy startups, mitigating emissions and achieving net-zero emissions will require significant reductions in resources and energy consumption – but, as doing so would not necessarily guarantee increased revenues and benefits, businesses may have trouble balancing sustainability goals with economic sustainability (Khalifa et al., 2022). This reconnects to the above-mentioned category: legal regulation obliging companies to measure their emissions may indeed help. There is, in turn, a growing need to promote the development and adoption of nation-wide regulatory frameworks to mitigate environmental impacts associated with digital entrepreneurship that simultaneously create economic benefits for entrepreneurs addressing these challenges.


CONCLUSION

This report presents various economic, institutional, social and technological challenges that inhibit digital entrepreneurs in Mexico from developing solutions for climate action. As the startup market keeps growing in the country, special consideration must be given to sustainable and digital technologies by governments, investors, accelerators and incubators, and other players in the ecosystem. Focusing on the four areas outlined has the potential to unlock environmental, social and economic impact associated with digital technologies. At the same time, a careful and thoughtful implementation is necessary to avoid negative consequences – for this, further discussion between the different stakeholders is needed.

FOCUSING ON THE FOUR AREAS OUTLINED HAS THE POTENTIAL TO UNLOCK ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT ASSOCIATED WITH DIGITAL TECHNOLOGIES

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