MILE ADVISORY | ENERGY FOCUSED CLIMATE FORWARD



MILE ADVISORY
REPORT 2023

Israel's Decarbonization Tech Ecosystem Report

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Israel energy decarbonization tech at a glance

APPROX. 700

Israel's climate ecosystem is reported to include over 800 startups

420

Companies are actively developing potential decarbonization solutions



152

Decarbonizationsts

direct responders to decarbonization needs

Predominantly active sectors: Energy Transformation, Transport

268

Enablers

enhancing decarbonization efforts or contributing to emission reduction

Predominantly active sectors: energy efficiency, efficient transportation, fuel savings, electricity network analytics, maintenance and management



62% of Decarbonizationists align with what seem to be the current value proposition

Noteworthy sub-sectors: Power, Hydrogen, Roads, and Building refurbishment



46% of Decarbonizationists drive technology crucial to achieving net-zero emissions by 2050



50% of Enablers leverage knowledge and skills derived from Israel's strength in software and cybersecurity domains

Predominantly active sectors: Industry 4.0 and energy transformation

Research question

To what extent does Israel play a supply role in the global demand for decarbonization technologies?

Disclosure: Company list available upon request and the startup list is updated regularly. For the complete list of companies, please contact us. Updated 2023 companies in appendix.

DEFINITIONS:

Decarbonization Technology: According to the IEA[1] and for the purpose of this report- decarbonization technologies are individual technology designs and components across the whole energy system that contribute to achieving the goal of net-zero emissions.

Decarbonizationists refer to a cluster of startups developing or utilizing technologies (technology designs and components) across the entire energy system that contribute to achieving the goal of net-zero emissions.

Enablers refer to a cluster of technologies that facilitate energy conservation and decarbonization across various sectors, including industries, buildings, and transportation. These technologies are essential in supporting renewable energy generation, transmission, electrification, and also enable the natural sequestration or industrial utilization of CO_2 as one of their benefits. Enablers play a pivotal role in advancing energy efficiency and sustainability goals.

RESEARCH LIMITATIONS:

- **Data Sources:** The predominant reliance on self-reported data and the incorporation of external data sources pose challenges in terms of data validation.

- **Definitions:** The absence of consistent metrics across databases for defining or categorizing companies or technologies presents a limitation. The allocation of companies to the IEA's list of clean energy technologies is primarily reliant on keywords extracted from company descriptions in different databases.

Israel's Journey Toward a Climate-Forward Future: Navigating Challenges and Seizing Opportunities

OPENING REMARKS

This report was initially scheduled for release in early October 2023. However, the personal and collective losses and challenges made it difficult to focus on anything beyond enduring. It is my hope that this report can serve as the foundation upon which to build a better future—a secure future, and one that includes an intelligent energy-focused and climate-forward strategy.

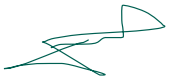
I firmly believe that any path forward must involve a strategic approach to addressing climate change, both within our internal ecosystems and through cooperative endeavors with current and future allies and partners. Both locally in the Middle-East and globally. I envision this report as a blueprint for creating the path forward, in alignment with the spirit of the Abraham Accords and collaborative efforts to transform the region.

Israel has long been celebrated as a global high-tech leader, earning the "Startup Nation" title for its exceptional ecosystem and innovative prowess. In recent years, Israel has formulated strategic initiatives in various domains, showcasing its dedication to addressing complex challenges. However, the decarbonization challenge stands apart. It demands a unified effort from diverse stakeholders, including government, academia, and the private sector.

> One of Israel's main challenges in realizing its potential is to support and coordinate its independent private ventures and align them with global demand, so that they are positioned to engage in the effort to decarbonize and seize opportunities set by global decarbonization initiatives.

Israel possesses the foundations for a burgeoning climate-focused community, poised to contribute to global decarbonization efforts. Within Israel's thriving private sector and high-tech ecosystem, the time has come to assume a substantial role in the race toward a net-zero future. Entrepreneurs, investors, innovation hubs, corporate leaders, and government-funded initiatives must recognize that becoming leaders in the global fight against climate change requires the development of a comprehensive strategy—a roadmap for transformative change that underscores the critical importance of decarbonization in achieving our shared climate-related goals.

Let this report be the catalyst for Israel's energy focused and climate forward journey, guiding us



Morielle I. Lotan,
Founder MILE Advisory

Executive Summary



The global imperative to reduce greenhouse gas emissions by 70-75% has elevated the transformation of our energy systems to a top priority.

Both public and private sectors worldwide are committing to this necessary shift, which demands a substantial investment estimated at $100-150 trillion by 2050.

The Compound Annual Growth Rate (CAGR) for decarbonization technologies[2] from 2015 to 2022 stood at 10%. This rate is anticipated to either remain steady on the conservative side or increase even more significantly on the aggressive side of projections. Global regulations aimed at mitigating greenhouse gas emissions will also exert a direct influence on businesses across every corner of the world further emphasizing the importance of this domain. The Biden administration's Inflation Reduction Act (IRA), signed in August 2022, accelerated capital flow into decarbonization and low-carbon technologies like solar, wind, green hydrogen, sustainable aviation fuel, and carbon capture. It lowered the net cost of capital for those companies by introducing tax credits and associated tax equity as a source of financing. JPMorgan reports over $100 billion in investments tied directly to the IRA in the last year alone. Israel stands poised with significant opportunities in this landscape, boasting emerging innovations and technologies that should not be overlooked.

Research base: IEA clean energy technology database, which encompasses over 500 technology metrics and components across the energy landscape. Through careful classification from various sources and databases, a curated list of technology enterprises specializing in decarbonization solutions, offering a comprehensive overview of Israel's potential contributions has been established.

RESEARCH FOCUS

This report focuses on Israel's current efforts in decarbonization while emphasizing the need for an evidence-based climate technology strategy to position Israel as a relevant and significant player in the global decarbonization market. Previous assessments of Israel's climate tech initiatives often underestimated the critical solutions required to achieve net-zero emissions by 2050. To provide valuable insights for private sector practices, investment strategies, startup development, and to inform public discourse and decision-making, Mile Advisory has conducted a comprehensive survey of Israel's climate tech startup ecosystem, with an emphasis on its role in decarbonizing energy systems. A key question explored in this report is the potential role of the "Startup Nation" in offering essential solutions for global energy demand and decarbonization.

MAIN INSIGHTS

01

Government Investment Disparity

Israel's level of government investment in research and development in the energy sector is five times lower - as a ratio of GDP - than other OECD countries. The average government investment in R&D for the energy sector as a ratio of GDP in OECD countries is around 0.02%, whereas in Israel, it stands at 0.004%.

02

Israel's Energy Supply Gap

There are 152 Israeli decarb-tech companies that are directly supplying 75 of the 500 (15%) clean energy technologies that the IEA has classified as in-demand. This is a clear indication of the need for data-driven decision making to build the foundation of a decarb-tech ecosystem and to answer for the quality of that cluster and the ways in which to further improve it.

03

Data driven investment opportunities

Approximately 46% of the (152 startups) are actively engaged in developing technologies that hold high and very-high importance in the context of achieving net-zero emissions by 2050.

04

Scaling Up Israel's Decarbonization Startups

While there are numerous Israeli startups in the decarbonization space, Israel can only realize achievements at scale if it were to develop solutions in line with global demand and priorities. Support from public investment and foreign venture capital is critical to Israel’s ability to participate in any meaningful way in the global climate economy.

05

Unlocking Israel's Decarbonization Potential

In the short to medium-term, Israel can realize significant benefit from leveraging its traditional strengths in areas such as software, security and artificial intelligence and more, to enable decarbonizing technologies.

To analyze Israel's technology supply, **Mile developed a unique methodology** based on correlating existing data from within the Israeli ecosystem along with the International Energy Agency (IEA) clean energy technology database[4], which encompasses over 500 technology metrics and components across the energy landscape. Through careful analysis from various sources and databases, a curated list of technology enterprises specializing in decarbonization solutions, offering a comprehensive overview of Israel's potential contributions, has been established.

The analysis laid out in this report reveals that while Israel's climate ecosystem includes, by several estimates, approximately 700[5] startups, data suggests that 152 startups are direct responders to decarbonization needs, termed '*Decarbonizationists*' in this work, addressing the highest priority climate change effort as defined by the IEA. These companies are primarily active in the Energy Transformation and Transport sectors, with 62% aligning with the current value proposition. Noteworthy sub-sectors include Power, Hydrogen, Roads, and Building refurbishment, and approximately 46% of '*Decarbonizationists*' are focused on technologies critical to achieving net-zero emissions by 2050. The data and findings in this report indicate that a gap exists between the demand represented by the IEA 500 clean energy technologies and the existing supply of 75 of those technologies in Israel.[6]

An additional cluster stemming from the data with a pool of 268 companies, termed 'Enablers', play a vital role in enhancing decarbonization efforts or contributing to emission reduction. These enablers predominantly offer digital software solutions, with around 50% focused on energy efficiency, efficient transportation, fuel savings, electricity network analytics, maintenance, and management. Roughly half of these companies serve the Industry 4.0 and energy transformation sectors, leveraging knowledge and skills derived from Israel's leadership in software and cybersecurity domains.

As for its role within decarbonization technologies, Israel currently does not occupy a central position in the global investment landscape. This observation is substantiated by the relatively modest level of foreign investments, which pales in comparison to other prominent sectors within Israel. Advancing decarbonization initiatives in sectors where Israel has a proven track record and substantial investment appetite, including in enterprise software, security solutions, and Artificial Intelligence (AI) is suggested as part of a strategy that could position the nation favorably in the global decarbonization landscape.

In the longer term, to develop and export advanced decarbonization solutions from incubation to growth, Israel will need to build a robust strategy that considers the demands of the entire decarb value chain and finds ways to collaborate at scale. Israel’s success in the solar and mobility sectors can serve as benchmarks. By embracing the methodology laid out in this report and its findings, Israel can enhance its position in the climate tech sector, attract international funding, and empower its human capital to lead the charge in decarbonization efforts and take part in developing a robust decarbonization centric strategy with Israel as a unique and significant actor.

Introduction

Prioritizing Energy System Decarbonization for Global Climate Mitigation and Emissions Reduction

SHAPING ISRAEL'S CLIMATE TECH FUTURE: THE NEED FOR STRATEGIC ALIGNMENT WITH NET-ZERO GOALS

Israeli climate technology startups have as of now showcased their offerings within a broad climate tech landscape but have yet to align with the imperative of constructing a framework of reaching net-zero by 2050, as set by governments and industry. This lack of correlation with the global efforts towards energy systems decarbonization raises questions about the role Israel will assume in the field - without a coordinated and informed strategy by Israel, aiming to encourage innovation along its own unique value proposition, it is much less likely that private ventures in Israel will converge on a path towards contribution to worldwide mitigation efforts through technological solutions.

The global drive to address climate change is rapidly gaining traction as governments and businesses adopt net-zero targets. As of July 2023, around 93 entities[7] accounting for nearly 79% of global greenhouse gas emissions, have committed to achieving net-zero status. **Israel is not one of them.** Moreover, while still far from achieving these goals and with a significant portion of commitments excluding scope 3 and value chain emissions[8], close to 40% of Fortune Global 500 companies are on their pathways to net-zero emissions. This surge in action is complemented by collaborative initiatives such as the UN-endorsed "Race to Zero," uniting non-state actors for climate action. These initiatives align with robust policies gathering momentum, including mechanisms like carbon pricing and support measures such as the Inflation Reduction Act (IRA) in the US, which directly allocates $500 billion towards clean energy funding[9] as well as the European's Green Deal Industrial Act committing $270 billion[10] providing substantial incentives for decarbonization across various sectors, with a primary focus on energy.

> Another notable effort is the "Climate Action 100+" initiative, led by over 700 investors overseeing a combined $68 trillion in assets, aimed at compelling major corporations, responsible for significant emissions, to take decisive climate action.

The focus on energy, or more accurately, the energy system, arises from its significant contribution to greenhouse gas emissions, accounting for approximately 70-75% of the total. Achieving net-zero emissions necessitates reducing energy consumption and transitioning to cleaner sources, posing both a notable challenge and a significant economic opportunity.

ALIGNING NDCs AND CORPORATE INITIATIVES: A FOCUSED APPROACH TO GLOBAL EMISSION REDUCTION

Notably, about 90% of governments have centered their National Determined Contributions (NDCs[11]) primarily on energy supply, while corporations are directing their efforts towards energy system decarbonization. This targeted approach addresses several central sectors—electricity production, industrial processes, transportation, and buildings—that collectively contribute to around 80% of global greenhouse gas emissions. In addition to optimizing energy use and production, projections indicate the vital role of carbon removal and capture technologies in directly addressing emission sources.

The key pillars driving energy sector decarbonization encompass enhancements in energy efficiency, wide-scale adoption of electrification, integration of renewable energy sources, development of hydrogen and hydrogen-based fuels, and carbon capture, utilization, and storage (CCUS) technologies.

These strategies collectively serve as the foundation for making substantial progress in emission reduction and charting the course towards achieving net-zero goals. Considering this context, how does Israel's climate positioning, and particularly the focus of its Climate- Tech ecosystem and the uniqueness of the Israeli startup nation contribute to addressing these global energy transition imperatives?

ISRAEL'S INNOVATION IMPACT: PIONEERING TECHNOLOGIES FOR 2050 NET-ZERO EMISSIONS

Innovation plays a central role in achieving the 2050 net-zero goal. Emerging technologies are shaping the crucial toolkit needed for net-zero emissions and cost-efficient decarbonization process[12]. Notably, the IEA highlights that almost half of the necessary emissions reductions for 2050's net-zero targets hinge on technologies currently in prototype or demonstration phases. This indicates potential for new tech development, alongside the impending commercialization and market adoption of existing technologies, mitigating risk for entrepreneurs and investors. From our analysis we see that among the companies with technologies falling between early prototype to demonstration passes as defined by the IEA , at a Technology Readiness Level (TRL) 4-7[13] Israel has roughly 30% (45 companies) in this bracket. When combining those at a higher TRL bracket (which signifies additional tech maturity), this is a proportionally significant number of companies to participate in the decarbonization goals that the IEA defines.

The energy system's transformation and the urgent need to limit global temperature rise to 1.5°C demands significant capital investments. Estimated investments needed, span[14] $32 trillion by 2030, and $100-150 trillion by 2050. According to estimates, a significant portion will target electricity, while Transport and Buildings will each command 16% investment share. **A significant portion of these funds will be allocated to electricity generation, networks, and electric end-user equipment[15]. The immense scale of these investments signals a crucial opportunity that Israel should not overlook.** For instance, consider the automotive & mobility[16] sector responsible

for 16.2% of global CO emissions[17]—a $2.6 trillion[18] market. Mobileye, holding 70% of the advanced driver assistance system (ADAS) market, forecasts over $2 billion[19] annual revenue in 2023. Innoviz Technologies, a LiDAR leader, eyes $3.3 billion by 2030 out of Total Addressable Market (TAM) of $100 billion[20]. The revenue projection for Innoviz and Mobileye technologies underscore the potential for high-revenue companies in the energy decarbonization tech realm. By examining the data-driven landscape of Israeli decarbonization tech and understanding the global IEA demand, we can correlate Israel's distinctive value proposition as a player in the decarbonization arena of Climate-Tech. Given this perspective, can both the public and private sectors, including the tech investors, incubators, accelerators, and startups afford to disregard the potential ascent of energy decarbonization technology companies with substantial revenues and impact over time? Considering the inherent variations in challenges, solutions, and investor environments within the climate tech sector, particularly in energy and decarbonization, Israel's recognition of the potential for companies to align with global technology demand and achieve noteworthy financial successes and environmental impact takes on vital significance.

DECARBONIZATION SOLUTIONS ECOSYSTEM: ALIGNING SUPPLY WITH GLOBAL DEMAND

Perceiving the ecosystem solely as an amalgamation of climate-tech solutions could lead to neglecting the true demand and primary market for decarbonization solutions. This report, therefore, illuminates the present solution landscape and its associated ecosystem, with the goal of enhancing comprehension of supply aligned with authentic decarbonization needs.

Notably, the demand for technologies as guided by the IEA was never intended, nor could ever be addressed by a single country in isolation. Instead, it requires each country and its ecosystem to identify their distinct value proposition, recognizing their standout attribute that can contribute to global decarbonization efforts, whether through collaboration or direct market influence. This forms the cornerstone of constructing an impactful strategy. Consequently, this report provides a foundation for informed government policies, investor fundraising, capital allocation, and a strategic lens for startups - whether they are operational and considering pivoting, or in the ideation phase - to effectively construct a data-driven strategy and participate in seizing this opportunity.

Methodology

1 DATA COLLECTION

We began by compiling a comprehensive list of Israeli technology companies in the climate-tech and clean energy sectors. Data sources included Start-Up Nation Central Finder, Crunchbase, and EnergyCom.IL. Only companies directly relevant to addressing energy-related CO_2 emissions were considered for inclusion in the study.

2 CLASSIFICATION BY IEA'S LIST

We classified companies according to the International Energy Agency's (IEA) comprehensive list of 500 clean energy technologies. We categorized companies by sector, sub-sector, and other relevant criteria. Companies actively developing technologies aligned with the IEA's clean energy technology list were categorized as "*Decarbonizationists*."

3 ENABLER CLASSIFICATION

We evaluated other companies based on their potential contribution to decarbonization efforts within energy systems. This included assessing their relevance to supporting renewable energy operations, promoting electrification, and enhancing energy efficiency across various sectors. We called them "Enablers," as they play a vital role in facilitating decarbonization.

4 FINAL COMPANY LIST

We generated a final list of Israeli decarbonization companies. This list was divided into two main categories: "*Decarbonizationists*" encompassing companies actively engaged in IEA-recognized clean energy technologies, and "Enablers" representing companies contributing to the broader ecosystem of decarbonization efforts within energy systems.

This methodology ensured a systematic and comprehensive assessment of Israeli technology companies in the climate-tech and clean energy sectors, facilitating the identification of key players and contributors in the pursuit of energy system decarbonization with a demand centric and evidence-based approach.

IEA clean energy technology database

This report aims to capture the state of Israel's energy decarbonization technology companies' ecosystem by mapping Israeli companies developing technologies that contribute to achieving the goal of a net-zero energy system, as defined by IEA's clean energy technologies[61], with a focus on companies that contribute to global mitigation efforts within the energy system.

The IEA stands as a pivotal organization in the realm of global energy policy and management and operates under the framework of the Organization for Economic Co-operation and Development (OECD). The IEA plays a vital role in monitoring energy market trends, analyzing energy policies, and offering valuable insights to its member nations. In recent years, the IEA has gained renewed attention due to its calls for urgent action in response to climate change. This has prompted the agency to advocate for net-zero emissions by 2050 and to release scenarios outlining pathways to achieve this critical goal. For the purpose of this work, we have adopted the 'How To Transition To Net-Zero' approach of the IEA, along with its detailed list of clean energy technologies achieve this goal[62].

The IEA categorizes the sectors as follows:

Energy transformation, encompassing the generation and storage of large-scale heat and power, along with its infrastructure. This category also includes the production and storage of synthetic hydrocarbon and hydrogen fuels, as well as biofuels.

Transport, which covers the end use and operations of road, aviation, and shipping vehicles, as well as infrastructure for charging and refueling.

Industry, addressing production processes and end-of-life considerations in hard-to-abate industries, along with battery recycling.

CO_2 management, which involves the storage, transport, and direct air capture (DAC) of carbon dioxide.

Buildings, encompassing heating and cooling systems, building construction and renovation, systems integration, lighting, and cooking solutions.

Once categorized, we developed a unique taxonomy and generated a database[63] of active Israeli companies that can contribute to the goal of decarbonization and net-zero, as defined by the IEA's clean energy technologies[64]. Each relevant company was classified according to its compatibility with IEA's Clean Energy Technology list (companies we call Decarbonizationists). Additional companies we call 'Enablers' are those with technologies that were not on the list but were classified according to the sector they serve and the category of enablement they provide.

IEA's database containing information about over 500 individual technology designs and components across the whole energy system that can contribute to achieving net zero emissions.

ENERGY TRANSFORMATION	
Power	67
Hydrogen	25
Biofuels	29
Heat	7
Synthetic hydrocarbon fuels	5
Refining	3
TRANSPORT	
Road	37
Shipping	20
Aviation	8
Rail	5
CO_2 MANAGEMENT	
CO_2 storage	6
CO_2 transport	2
Direct air capture	2
INDUSTRY	
Chemicals and plastics	29
Battery recycling	28
Cross-cutting	25
Cement and concrete	23
Iron and steel	18
Pulp and paper	16
Aluminum	8
BUILDINGS	
Heating and cooling	65
Construction and renovation	34
Systems integration	8

Israel's energy decarbonization technology ecosystem

TWO DISTICNT CATEGORIES OF DECABONIZATION COMPANIES

According to our analysis, Israel has 420 companies developing technologies capable of addressing decarbonization efforts. These companies operate across several sectors, including Energy Transformation, Industry, Transportation, Buildings, and CO_2 Management.

Approximately 152 of them are startups that directly address decarbonization needs; we refer to them as Decarbonizationist companies, based on a term defined by the IEA as "technologies (technology designs and components) across the entire energy system that contribute to achieving the goal of net-zero emissions." These companies primarily operate within what appears to be Israel's core value sectors: Energy transformation – Power and Hydrogen, Transport – Road, and Buildings - Building construction and renovation sub-sectors. Together, these sub-sectors account for 66% of '*Decarbonizationists*'.

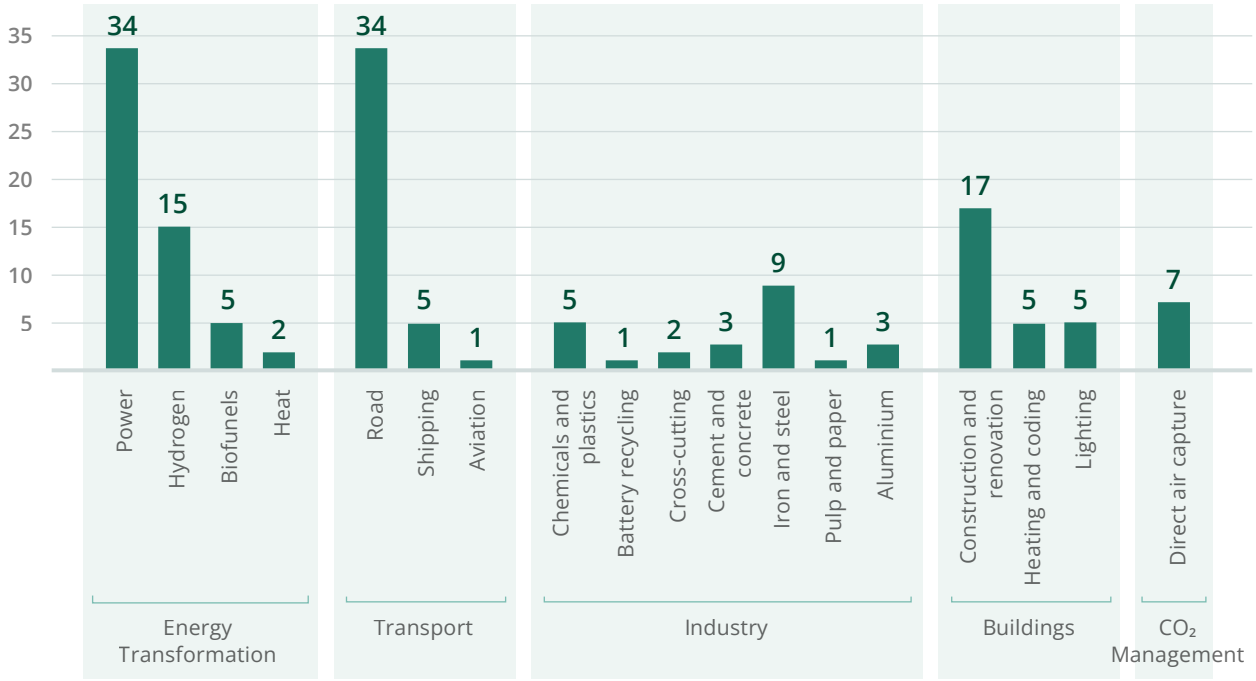
Breakdown of startups by type

152
Decarbonizationists

268
Enablers

Source: IEA, Start-up Nation Central, Crunchbase, EnergyCom. IL and MILE Advisory analysis

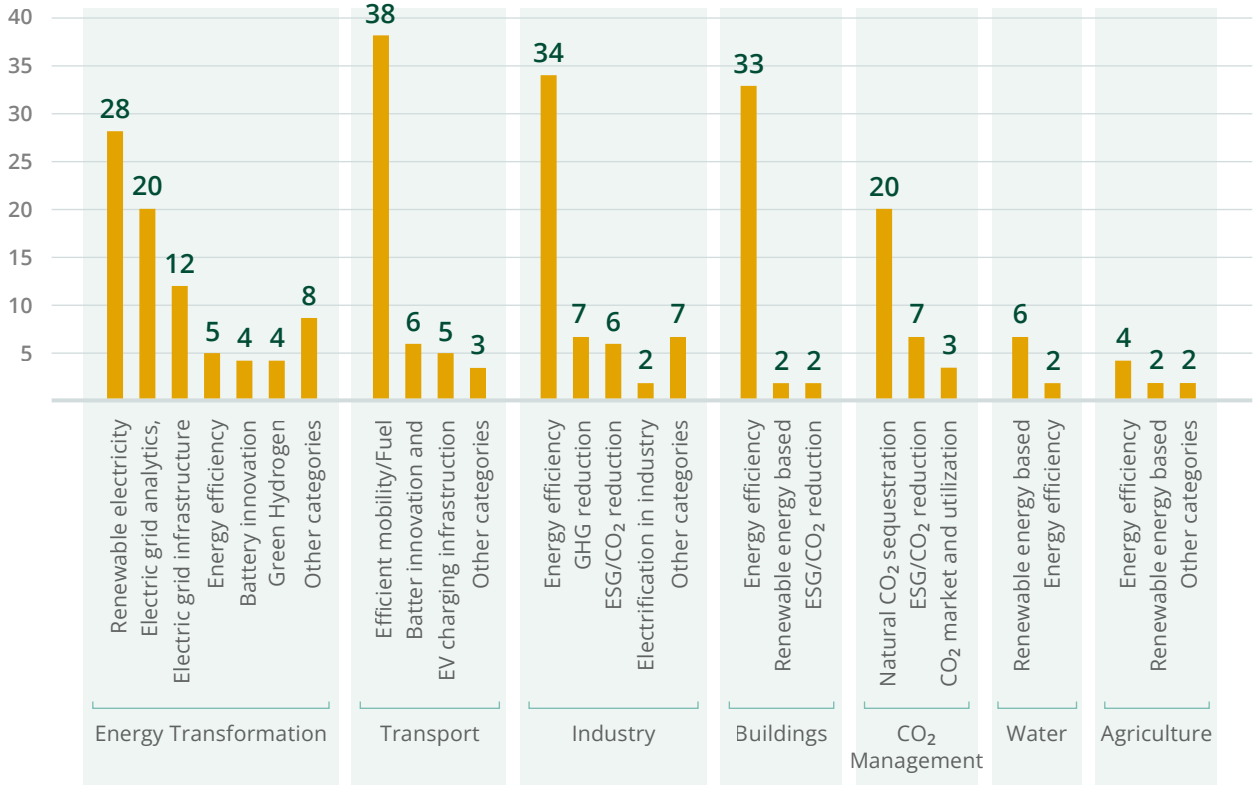
Decarbonizationists by sector and sub sector (number of companies)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

The remaining , 268 companies we call 'Enablers': companies with complementary or supporting technologies or ancillary to decarbonization.

Enablers by sector and sub sector (number of companies)

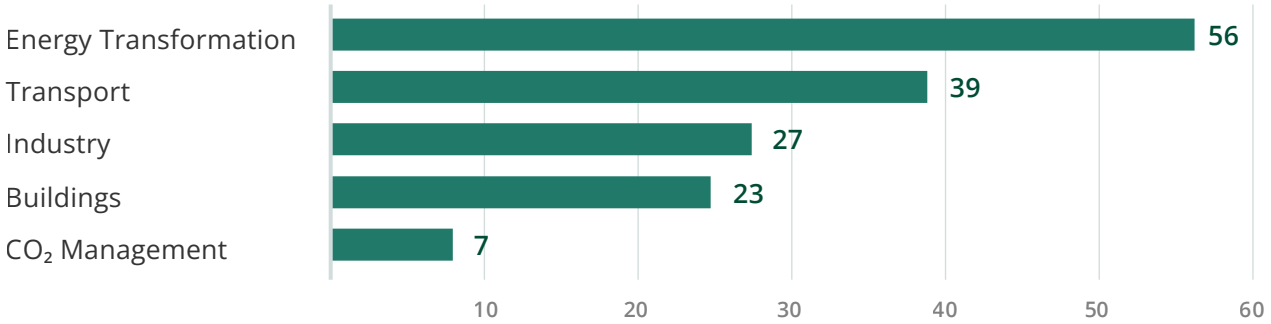


Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

DECABONIZATIONIONISTS

Most decarbonizationists, about 62%, provide solutions and technologies for Energy transformation and Transport sectors.

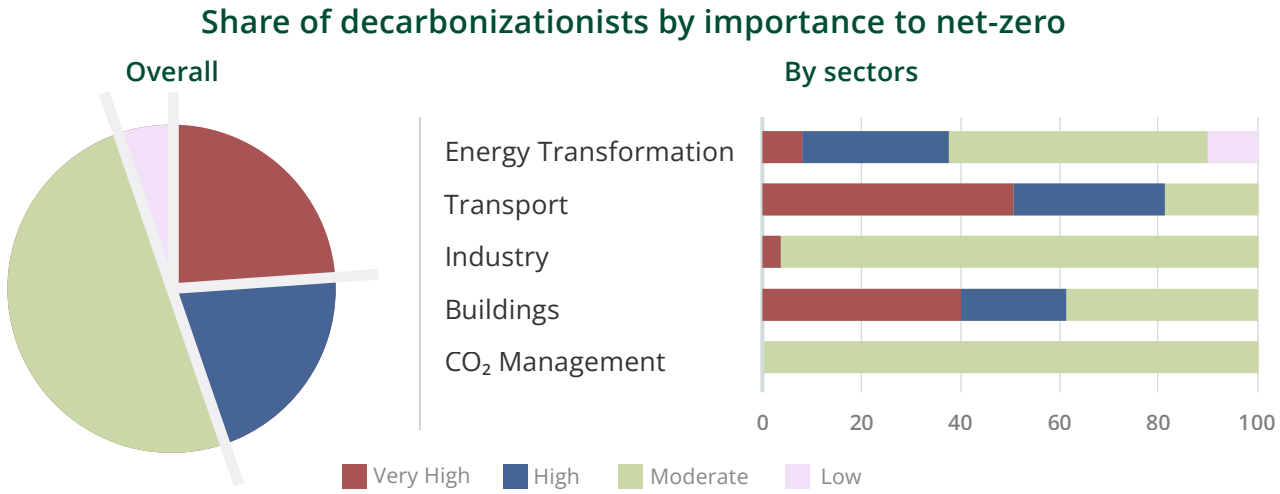
Decarbonizationinsts by sectors (number of companies)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

Approximately 46% of startups are actively engaged in developing technologies that hold high and very-high importance in the context of achieving net-zero emissions by 2050[21]. This signifies that nearly half of these companies possess the potential to make substantial contributions to the decarbonization journey and its acceleration. Notably, many startups in the transport sector, designated as Decarbonizationists,have potential to significantly impact decarbonization within this sector. However, it is worth noting that within the industry sector, a minority of Decarbonizationists are developing technologies with an impact that surpasses moderate levels.

Furthermore, the number of companies that address this sector is relatively lower, particularly in the hard to abate industries such as Iron and Steel, Cement and Concrete, Chemicals, and Plastics. The technologies required for these industries, often situated in Technology Readiness Levels (TRLs) 7-11, are predominantly centered around high-temperature heating, alternative approaches, and Carbon Capture, Utilization, and Storage (CCUS) solutions[22], and as of today, Israel does not have a sufficient supply of solutions in these areas potentially missing out on a significant opportunity. Since the rate of investments in global clean energy technologies in 'industry' is relatively low[23] it would make sense that the demand for technologies is proportional, but this should be revisited as investment trends can change in the future. When building energy strategies in 2024, connection to future demand with additional readiness levels including integration and regulatory readiness levels should be considered.



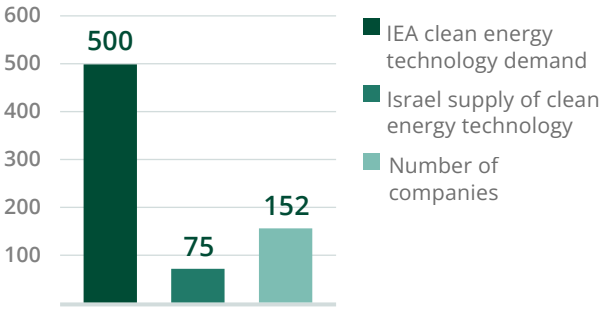
Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

DECARBONIZATIONISTS – SUPPLY OF SOLUTIONS

Currently, Israel supplies **75 of the IEA's 500 clean energy technology demand, through 152 companies.**

Our analysis has identified the availability of diverse decarbonization technology categories within certain sectors. For instance, within the energy transformation sector, technologies related to power and hydrogen sub-sectors are notable. Similarly, in the transportation sector, road sub-sector technologies exhibit a range of options. This variety underscores the array of solutions at hand, offering multiple avenues to address decarbonization challenges effectively in these sectors.

IEA clean energy technolgy demand, supply and total number of Israeli companies



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

EXAMPLES

INDUSTRY

Nitrofix
Generating Zero Carbon Emissions Ammonia
Importance for net-zero emissions (IEA): Very High
IEA subsector: Chemicals and Plastic

TRANSPORT

Addionics
High-performance Rechargeable Batteries
Importance for net-zero emissions (IEA): Very High
IEA subsector: Road

BUILDINGS

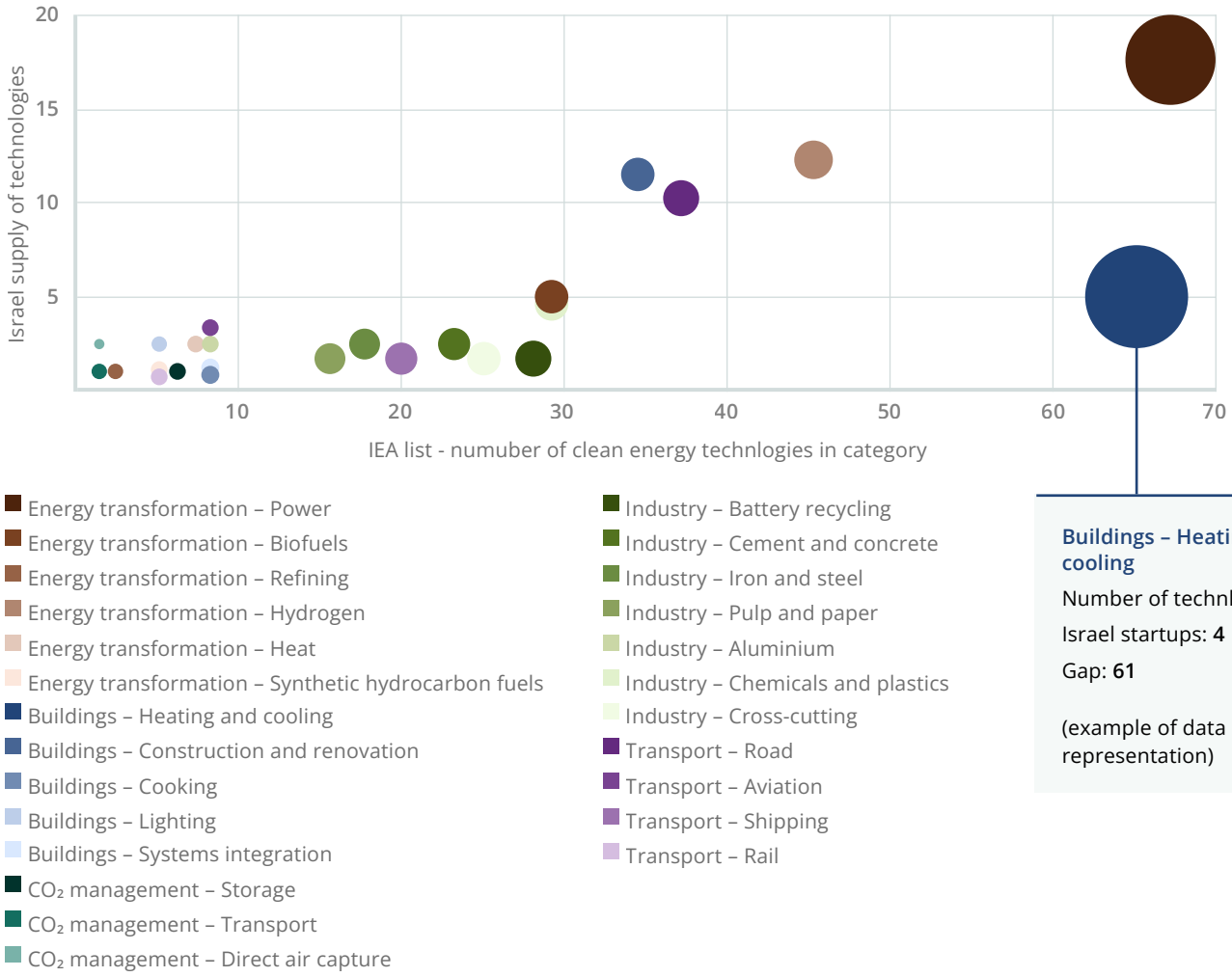
Criaterra Innovations
Environmentally Friendly Building Materials
Importance for net-zero emissions (IEA): High,
IEA subsector: Road

Nonetheless, notable discrepancies persist between the existing decarbonization technologies and the available pool of decarbonizationists in Israel. To illustrate, consider the heating and cooling of buildings sector, where a substantial disparity exists between the available supply of Four technology categories and the demand for 65 potential technologies, as stated by the IEA, required for comprehensive decarbonization in this domain.

These noteworthy discrepancies are not restricted to sectors but also permeate into domains where Israel possesses a relatively robust technology inventory. For instance, within the energy transformation sector, encompassing 67 demanded technologies contributing to net-zero emissions objectives, a deficiency is evident. Despite the availability of 34 active companies, merely 17 of these technologies are offered within the local landscape. Analogous dynamics play

out in the realm of hydrogen technologies, where a collection of 12 technologies is available, yet the demand calls for 45 technologies. **This underscores a crucial observation:** although a promising pool of solutions exists across various developmental stages or market availability, it significantly lags the necessary demand essential for impactful decarbonization endeavors.

Number of IEA clean energy technologies VS. number of categories Israeli companies provide (balloon size = gap)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

Specific categories, notably the industry sector and certain segments within buildings (heat and cooling) and energy transformation (biofuels), suffer from a restricted availability of decarbonization technologies. This limitation potentially leads to missed opportunities for cultivating expertise and leadership. This underscores the significance of developing a comprehensive array of solutions, particularly in the nascent stages of technology and company advancement. In this context, prioritizing the promotion of diverse solutions becomes imperative.

Through the cultivation of a diverse portfolio, we establish a foundation for heightened prospects of success and innovation. This strategy facilitates a natural process of adapting to the market and selecting solutions driven by needs. As the landscape evolves, the most effective and pioneering solutions, technologies, and companies naturally prevail, aligning with market demands and paving the way for enduring growth and sustainability in the long run.

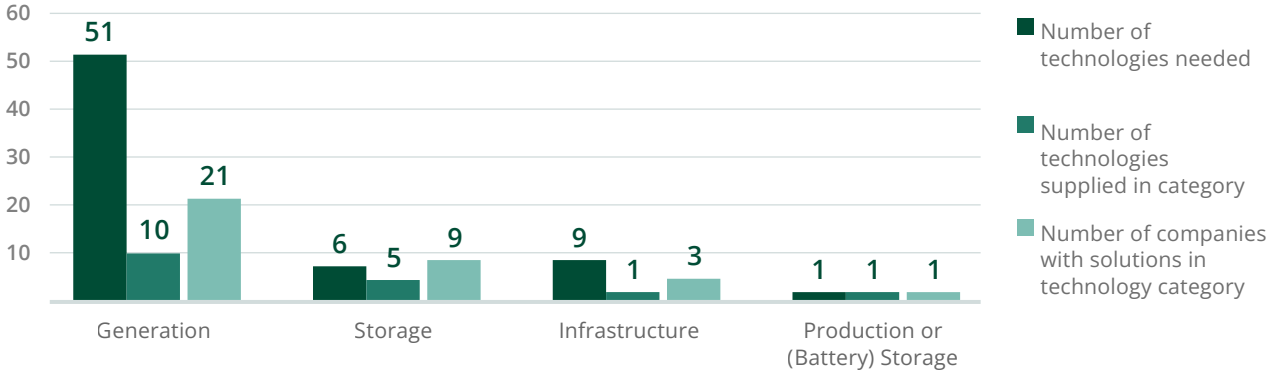
DECARBONIZATIONISTS IN THE ENERGY TRANSFORMATION SECTOR

The energy transformation sector holds a pivotal role as a primary source of CO_2 emissions, responsible for about 20% of global GHG emissions[24]. **Despite global efforts in decarbonizing the power sector in recent years, electricity and heat generation were responsible for nearly 44% of global CO_2 emissions from fuel combustion, with coal plants emitting around 73% of the associated emissions.** These numbers are rising.

These domains necessitate a substantial transformation not only for their own decarbonization but also to facilitate the decarbonization of other sectors. Within this sector, the power sub-sector emerges as a significant contributor to demand for clean energy technologies, as identified by the IEA.

The primary requirement for technologies within the power sub-sector centers around the generation stage of the value chain. While a notable 21 companies across 10 distinct technology categories within the power sub-sector contribute solutions for the generation category, there remains a wide spectrum of untapped opportunities for technology development.

IEA clean energy technolgy demand, supply and total number of Israeli companies



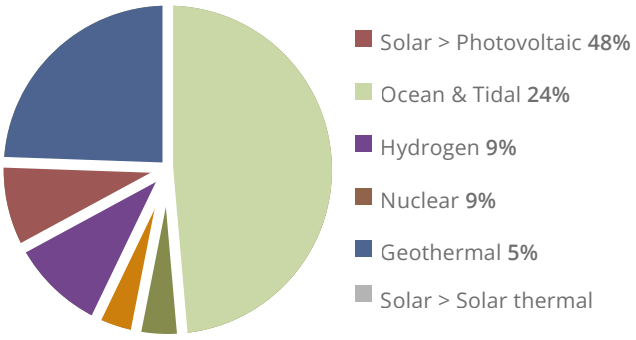
Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

Israel boasts a noteworthy track record of established solar technology companies that have operated successfully for an extended period. Notably, it ranks within the top five G20 countries for solar power expertise, as highlighted by existing research[25]. This proficiency is also reflected in the substantial presence of Decarbonizationists, comprising nearly half of the companies within the generation category. Given that renewable sources of electricity hold a pivotal role in achieving overarching decarbonization objectives, their significance cannot be understated. **The imperative to increase renewable generation eightfold by 2050[26] underscores their immense potential, with Solar PV technology emerging as a key driver of this transformation. Consequently, it remains imperative for Israel to uphold its leadership in this domain and capitalize fully on its inherent potential.** Furthermore, pushing the technology envelope by developing transformative solutions such as Israel's first fusion energy startup[27] will assist in building a new decarbonization ecosystem.

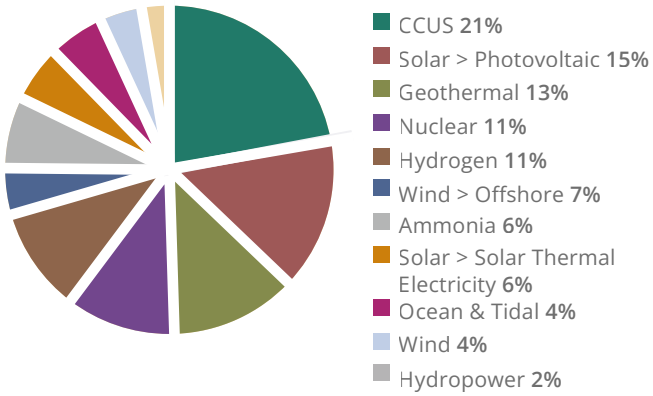
Ocean & Tidal technologies represent another field marked by considerable company presence and promising potential. Notably, an Israeli company has already successfully entered the Nasdaq stock exchange in 2022[28]. Moreover, the existence of some experienced companies indicates

the possibility of additional contenders emerging, driven by the technology's maturation and the global market potential of $10 billion by 2031[29]. The government of Israel should ensure that adequate support is provided to these companies since they hold the potential to open new segments and bring in new expertise, and possibly some of Israel's decarbonization unicorns.

Energy transformation–power-generation companies by technlogy category (% share)



Energy transformation–power-generetaion technologies needed (% share)



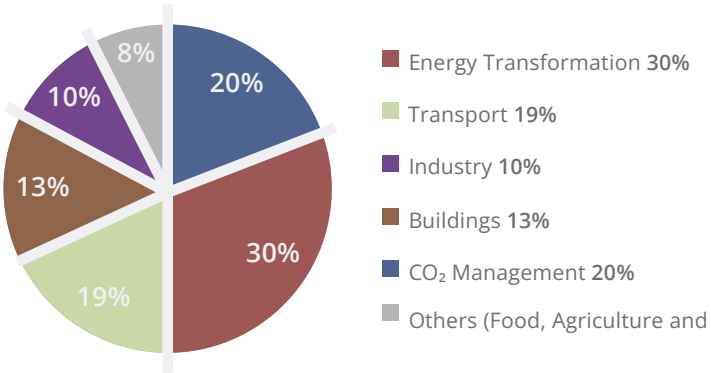
Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

ENABLERS

In addition to decarbonization technologies that either replace fossil energy sources or significantly reduce direct **carbon emissions,** a wide array of enabling technologies further enrich the landscape. These technologies are instrumental in promoting energy conservation across industries, buildings, and transportation sectors. Furthermore, they assume a critical role in bolstering renewable energy production, its distribution, electrification, and even facilitating the sequestration or industrial application of CO_2.

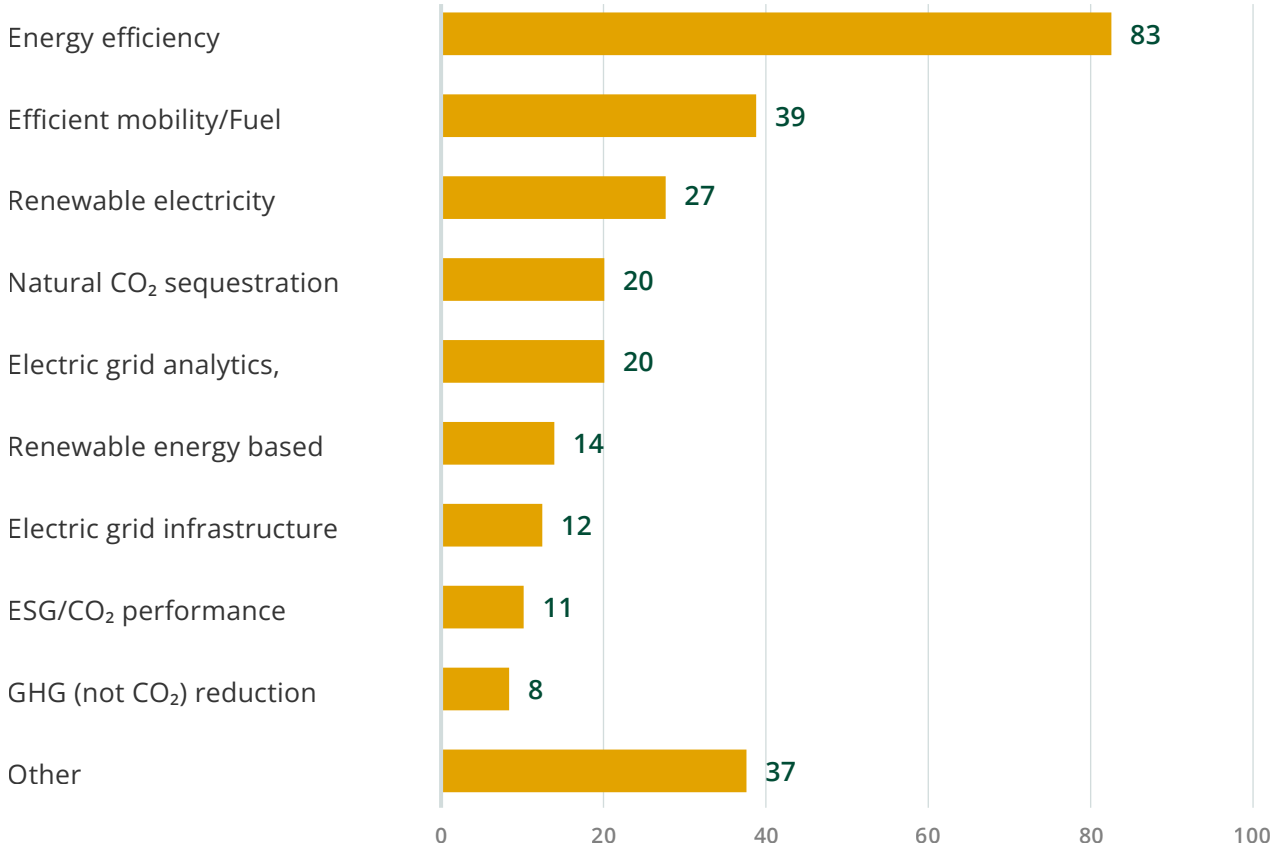
Our comprehensive **analysis** identified a cluster of companies that align with this enabler profile. This group, encompassing 268 Israeli companies, serve as crucial support for technologies, with over 50% of them offering solutions tailored to the Industry and Energy transformation sectors.

Enablers by sectors (number of companies)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

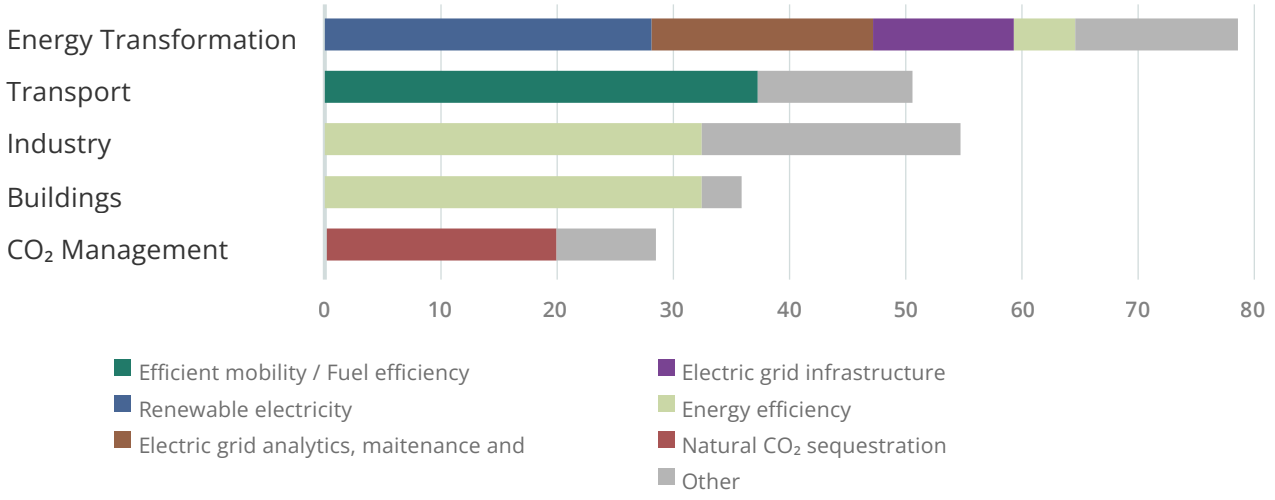
Enablers by type (number of companies)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

Energy efficiency and efficient mobility/fuel efficiency solutions and technologies provide the highest number of companies in each category within Transport, Industry and Buildings sectors.

Most dominant enabler types by sector and sub-sector (number of companies)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

EXPLORING DEEPER: REVEALING ENERGY EFFICIENCY AND GRID ENABLERS

In a comprehensive examination of companies specializing in Energy Efficiency, Efficient Mobility/ Fuel Efficiency, and Electric Grid Analytics, Maintenance, and Management, we've identified a group of 129 companies. Remarkably, these companies represent more than 48% of the enablers in our analysis. Within this subset, an impressive 63% are active in the Energy Transformation, Industry, Transport, and Buildings sectors. These entities primarily focus on developing monitoring, control, communication, analytics, optimization, and related solutions, with some incorporating AI into their offerings.

As highlighted by the IEA, the role of digitalization and software-based solutions cannot be underestimated. They stand as vital components for enabling the swift integration of renewables and driving infrastructure transformations within the energy sector[30].

Digital enablers emerge as pivotal players in catalyzing decarbonization efforts across a spectrum of themes, extending beyond those previously highlighted. Notably, they hold the potential to address challenges beyond energy efficiency, including the critical issue of capital availability for renewable energy projects and their financing in middle-income countries.

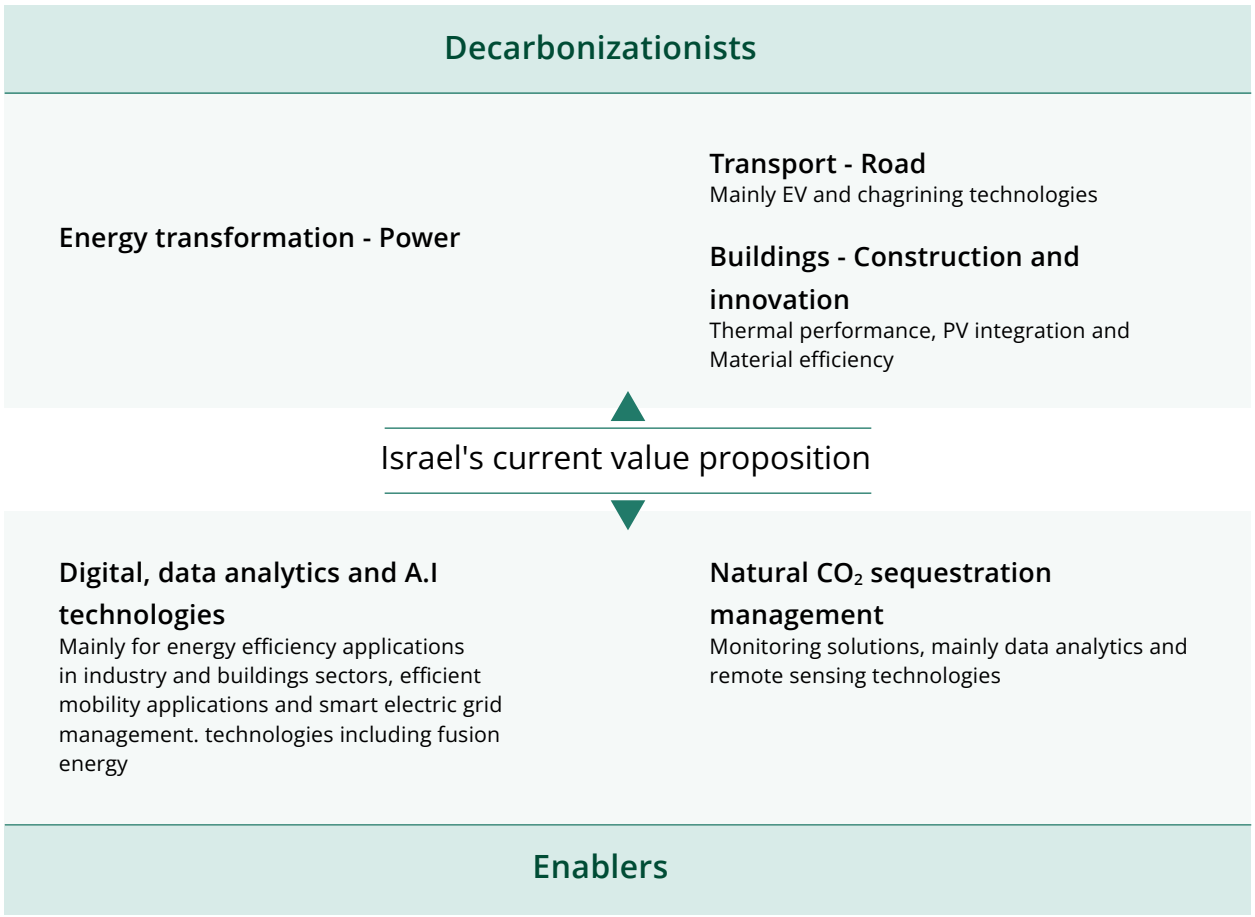
As of today, a staggering 85% of global renewable energy investments have disproportionately favored less than half of the world's population. A stark illustration of this divide is evident in Africa, where a mere 1% of additional capacity was added in 2022[31], predominantly due to the elevated cost of capital and requisite returns driven by heightened risk factors[32].

Israel's expertise in digital solutions and software serves as a solid foundation for its role as an energy enabler. Leveraging its proficiency in areas like cybersecurity, Israel has the capacity to provide complementary solutions and expertise to Decarbonizationist companies, both locally and globally.

With its reputation for hosting numerous multinational R&D centers and attracting significant multinational company activity, Israel is positioned to not only foster domestic collaboration but also draw foreign companies into partnerships, even when they are navigating the developmental and commercial phases of their hardware technologies.

ISRAEL'S CURRENT VALUE PROPOSITION

As our analysis shows, Israel's main value proposition (fields, sectors and technology categories where there is a noticeably high number of companies or relatively high supply of clean energy technology categories in relation to demand required for energy system decarbonisation) is as follows:



Despite the appealing proposition from the Israeli ecosystem, there is still a gap in current and near future supply of clean energy technologies. The opportunity in decarbonization of the building sector is massive with a forecasted annual addressable market by 2030 of $1.5 trillion on average[33]. It seems like heating and cooling hold enormous demand in terms of number of potential technologies that apply to the sector's decarbonization needs. There is however an apparent gap between supply and demand, and Israeli companies are only able to meet a limited number of these needs

Another sector is Industry (hard-to-abate industries), where Israel appears to provide an answer. There are relatively only a few clean energy technologies categories that are met, but many companies are in the field of additive manufacturing, where Israel has a vibrant ecosystem. However, CCUS, battery recycling, and other high and medium temperature heat-related technologies are still in short supply.

Capital and Support for Energy Decarbonization Technology Companies

INVESTMENT AND FUNDING TRENDS

Unlike the prevailing global trends in energy investments, Israel's trajectory has taken a distinctive course. While Israel has embraced initiatives related to the net-zero future, such as automotive and smart mobility, it has also diversified into various domains, cultivating expertise in areas like protein alternatives, cultured meat, and precision agriculture. While these endeavors hold value, they may not directly align with the primary goals of a decarbonization-focused midterm strategy.. In recent years, there has been a noticeable increase in the number of investment deals within the climate-tech[34] sector, encompassing energy decarbonization technologies. Despite a reduction in the total investment amount in the preceding year (2022), a trend observed across various sectors of technology, the global share of climate-tech investments rose from 8 to 10%[35]. However, it's noteworthy that the allocation of global climate-tech funding since 2020 has predominantly favored companies in the transportation sector, followed by the energy vertical[36].

Interestingly, within the context of Israel, companies associated with the energy transformation sector received a relatively smaller portion of the funding pie, amounting to $1.78 billion in the period from 2015 to 2023, accounting for 23% of climate-tech funding[37]. This trend contrasts with the global landscape, where the clean energy technology sector secured the second-highest funding share between 2020 and 2023, following the transportation sector.[38],[39] These patterns run counter to the observation that the decarbonization sector boasts the highest number of companies, and among enablers, it ranks second in strength. Notably, based on data from Start-Up Nation Central (SNC[40]), a substantial portion of funding—80% for climate-tech and 75% for clean energy initiatives—has been allocated to companies in their early funding stages. This underscores the importance of ensuring the availability of subsequent funding rounds for sustained growth.

In recent years[41], Israeli climate-tech funding has exhibited a mixed investment trend with a higher prevalence of local investors compared to foreign investors, diverging from the broader pattern observed in the Israeli high-tech industry where foreign investors constitute the majority. This could suggest that the appeal of Israel's climate-tech sector, particularly in clean energy, may be comparatively lower for global investors and in disconnect from market needs and global supply demand. In contrast, sectors like enterprise software, cybersecurity, and fintech[42] continue to attract[43] substantial foreign investment[44], accounting for 63%[45] of all funds invested in Israeli high-tech.

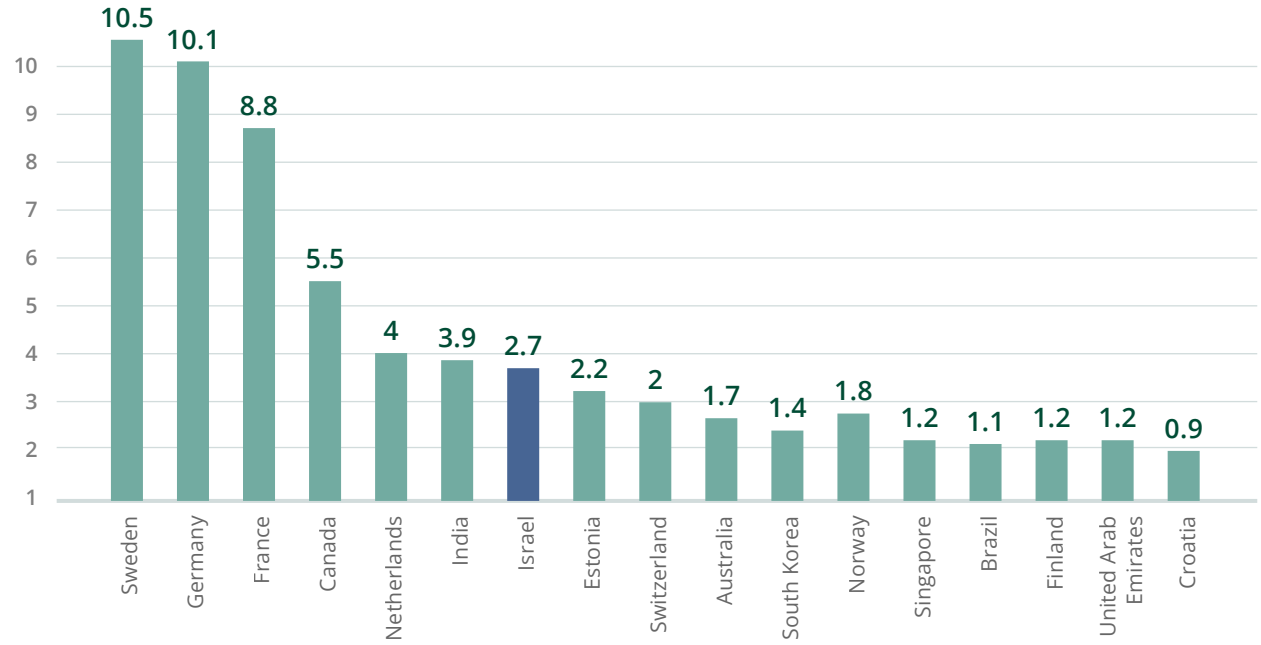
This disparity suggests that Israel's decarbonization technologies are not the primary focus for global investors. This is due, among other factors, to a shortage of suitable startup opportunities in terms of both quality and quantity. Furthermore, Israel still lacks dedicated funds that could help investors establish a financing horizon for startups in this field and develop expertise

and experience in this sector. In fulfilling these elements, the innovation ecosystem could also overcome the gaps in investment knowhow and long term vision, which were identified by a local investor interviewed for this report as other constraining factors for activity in this field.

According to Dealroom data, Israel is positioned as the tenth-largest in terms of total investment amount from 2018 to 2023, but most of the funding has not been allocated towards decarbonization. While Israel's rank is tenth, the margin between it and the countries following isn't significantly wide. Additionally, in 2022, investment volumes in several countries approached or mirrored Israel's, indicating a noticeable decline in Israel's investment amount compared to other nations.[46]

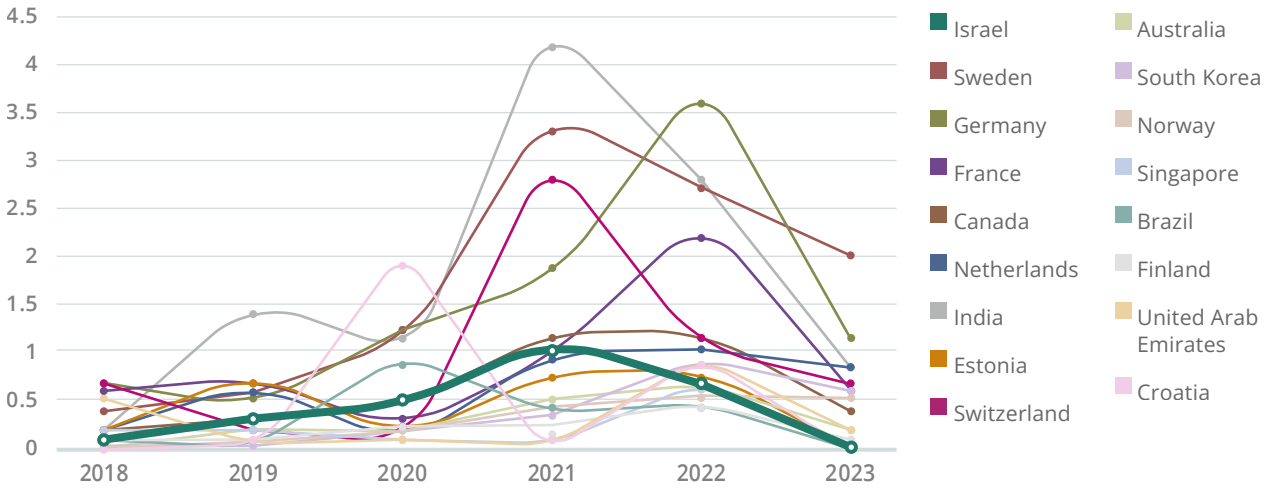
Even Israel's relatively high ranking in climate tech funding in relation to other countries, does not indicate its place in funding in the field of clean energy, since most of the investments are in the field of Agri & Food technologies. A case in point: since 2020, Israel ranks only behind the United States in venture-backed climate company investments in the Food & Land sector, amassing $20.3 billion[47].

Total climate tech funding (2018-2023), by country ($, billions)



Source: MILE ADVISORY analysis based on IEA, Start-up Nation Central, Crunchbase and EnergyCom.IL

Climate tech funding (2018-2023), by country ($, billions)



Source: Dealroom

DIRECT GOVERNMENT FUNDING AND SUPPORTING EFFORTS SHOULD BE IMPROVED

Government funding assumes a vital role in bridging funding disparities and providing crucial support within the climate-tech landscape. Governments offer substantial support to research and companies at various stages of their development. Notably, organizations like Mission Innovation (MI), a bilateral initiative focused on enhancing government-backed support for clean energy research and development, play a significant role in this regard. Although Israel is not a part of MI, its member countries jointly contribute around 90% of global spending on clean energy R&D. In 2022, MI Members collectively allocated $10.6 billion[48] to clean energy innovation, with future plans aimed at a substantial investment budget of $90 billion dedicated to demonstration projects[49].

In 2021, global public R&D funding for clean energy technologies reached a notable $38.4 billion[50], as reported by the IEA. Noteworthy is the increased commitment of leading countries, as highlighted by the IEA, which have augmented their public R&D budgets from 2014 to 2021[51]. These financial commitments underscore substantial monetary investments. However, it is noteworthy that Israel, a non-member of MI, does not align with the trend of bolstering public R&D funding for clean energy technologies. In Israel, the government-funded portion of total R&D expenditure[52] spanning beyond energy or climate tech, accounts for only 10%, while the corresponding figure is approximately 30%[53], in Europe.

As potential capital shortage could hamper the development of a clean energy sector, government investment must facilitate the development of a clean energy sector.

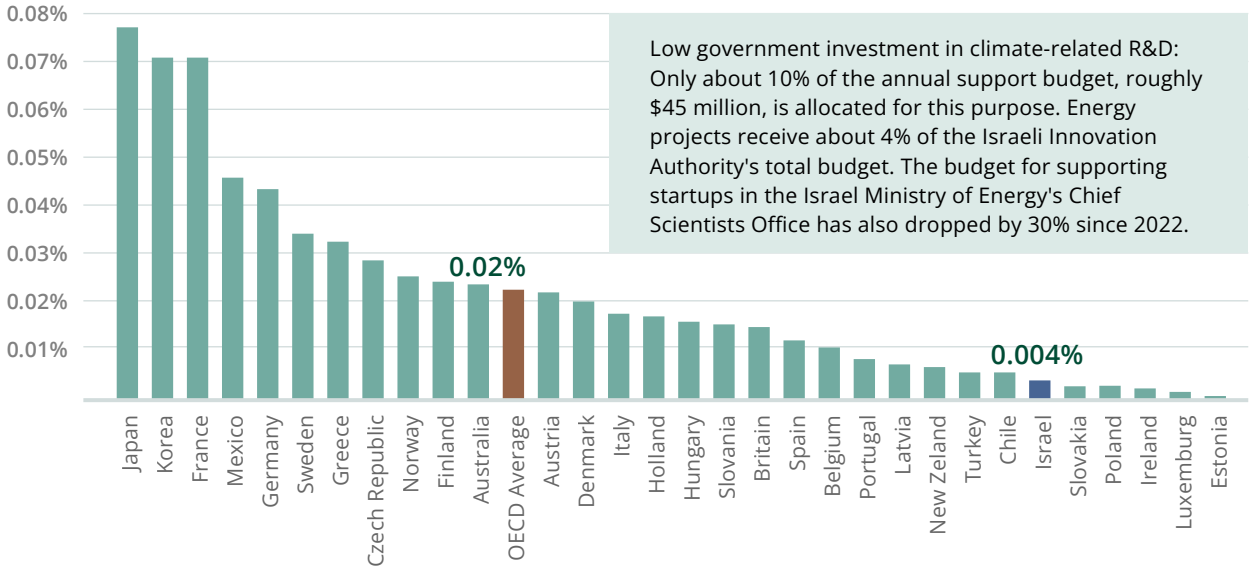
When comparing global government investments in clean energy R&D, it becomes evident that Israel's level of government investment is comparatively low. The average government investment in R&D for the energy sector as a ratio of GDP in OECD countries is around 0.02%, whereas in Israel, it stands at 0.004%[54]. Given the pivotal role government R&D clean energy innovation[55] plays in driving Israeli clean energy[56], Israeli clean energy companies may encounter difficulties in progressing their technologies due to this funding shortfall.

The data clearly illustrates the support gaps and how an informed and effective investment strategy can address them. Government backing for R&D in climate-related fields, administered by the Israel Innovation Authority (IIA), accounts for about 10% of its annual support budget, which translates to approximately $45 million[57] annually, with energy-related endeavors comprising a portion of this amount, estimated at around 4% of IIA's total budget[58]. Moreover, the budget for supporting startups within the Chief Scientist's Office at the Israel Ministry of Energy has experienced a 30% decline since 2022[59].

Adding to this, a government program with a proposed allocation of $3 billion NIS for investments in climate-tech until 2026 has yet to secure approval[60].

This financial landscape highlights the notable disparity between Israel's available public funding and the substantial investments being made by member countries of initiatives like MI and other competitive entities.

Government R&D investment in the energy sector as a percentage of GDP ratio



Source: Office of the State Comptroller

Considering the data presented, it becomes imperative for the government to play an active role in facilitating Israeli companies' access to global funding. This could be achieved by enhancing their capacity for bilateral collaborations with international companies and providing avenues for them to gain insights into the demands and requirements of key markets. This could also mean a reduced barrier to export solutions, as well. An experienced investor in the climate-tech field, interviewed for this report, emphasized, "Israel's ecosystem excels at problem-solving, but lacks sufficient familiarity with the field's needs and challenges." Therefore, facilitating knowledge dissemination is crucial for nurturing the upcoming wave of potential entrepreneurs.

The Israeli technology and entrepreneurship sector, distinguished by its unique culture and conditions, has achieved significant global impact, particularly in medicine, software, digital hardware, and agriculture. Leveraging its primary strength in human capital and innovation expertise, this sector is well-positioned to play a crucial role in addressing the critical challenge of global decarbonization, provided this is recognized as a valuable objective.

Conclusion

In an era where data-driven decision making and insights hold unparalleled significance, constructing a future-ready climate strategy hinges on the ability to harness global demand information. It is this crucial data that should inform and shape intelligent supply-side development and innovation. The insights gleaned from this approach are paramount, for they guide industries, nations and regions towards their unique product-market fit as climate players.

Israel stands at a pivotal juncture. The global call to reduce greenhouse gas emissions by 70-75% is an imperative that cannot be ignored. Yet, the path to becoming a significant climate player may not lie solely in focusing, investing, and developing decarbonization solutions. Israel must scrutinize its unique strengths, capabilities, and positioning in the climate landscape.

The essence of an effective climate strategy lies in Israel's ability to zero in on its own distinctive role, and set a comprehensive innovation-oriented investment strategy that addresses the areas of the highest impact, based on dedicated research of global demand. Israel's potential as a climate innovator may extend beyond the realm of decarbonization. It could encompass becoming an "Adaptation Nation," specializing in solutions that address the growing challenges posed by a changing climate.

However, forging an intelligent path forward demands a clear understanding of the current climate tech landscape in relation to global demand. It necessitates the ability to decipher where Israel's strengths and unique value propositions intersect with the world's pressing climate needs. This informed snapshot is crucial in crafting an actionable climate plan.

The global effort to decarbonize demands a coordinated international approach, where each country capitalizes on its unique strengths to contribute to a comprehensive solution for the substantial challenges in decarbonization. To accomplish this, countries should begin by evaluating their position concerning global technology demands and objectives. Subsequently, they should conduct a thorough analysis of their technological developments, assessing their alignment with global requirements and their potential integration with other technological solutions. This holistic strategy ensures that all aspects of the value chain are considered, resulting in a comprehensive solution that effectively addresses the demands of decarbonization.

Israel as a case-study for such an approach has achieved remarkable success as the "Startup Nation" within a relatively short time frame. Israel's strengths have led to significant accomplishments in industries where it excels, such as enterprise software, fintech, and cybersecurity, attracting substantial investment and government support and yet, it is unclear what type of climate change actor Israel will be.

Within Israel's renowned thriving hi-tech ecosystem that characterizes the nation's innovation landscape, the time has arrived to consider assuming a pivotal role in the global race towards a net-zero future. Entrepreneurs, investors, innovation hubs, and government-funded initiatives must recognize that the path to becoming leaders in the global fight against climate change

necessitates the development of a comprehensive strategy. This strategy should serve as a blueprint for transformative change, supported by a well-coordinated operational plan that emphasizes the critical importance of collaboration in achieving our climate-related goals. This report aims to be the bedrock of such a strategy and act as a starting point to assess Israel's role as a decarbonization actor in the global race to net-zero.

Appendix

ENABLERS

SECTORS	ENABLER TYPE	ENABLING WHAT?	DESCRIPTION
Industry Energy transformation Data center* Agriculture*	Energy efficiency	Reduction of direct energy/electricity consumption	Every technology that contributes to energy efficiency- energy monitoring in manufacturing and buildings etc
Energy transformation	Electric grid analytics, maintenance, and management	More plannable, flexible, reliable electric grid> Better grid planning, more renewables implementation and utilization and lower redundancy.	
	Electric grid infrastructure	Physical deployment and expansion of the grid.	Any technology that ensures the integrity of and physical expansion of electricity networks. including hazards prevention, weather prediction, underground lines enablers etc.
	Renewable electricity	Zero emissions energy/ electricity	All soft enablers: maintenance, management, investment and trading etc.

SECTORS	ENABLER TYPE	ENABLING WHAT?	DESCRIPTION
Transport	Efficient mobility/Fuel efficiency	Reduction of direct energy/fuel consumption	Efficient route planning and logistics, more efficient ICE etc.
	EV charging infrastructure	Mobility electrification	Fintech, EV charging management platforms etc.
CO_2 management	Natural CO_2 sequestration	Natural capture of CO_2 stocks	All enablers of tree and natural CO_2 sequestration, including wildfire prevention etc, monitoring and analytics and new nature-based sequestration concepts
CO_2 utilization	Captured CO_2 utilization	Economics of CO_2 capture and replacement of raw materials	
Industry Agriculture* Water*	Renewable energy-based process	Zero emissions energy/ electricity Decentralization of energy production/consumption, efficient grid	Moving or implementing the usage of renewable as energy source in a process
Industry	GHG (not CO_2) reduction	Reduction of direct GHG emissions that are not CO_2, from manufacturing process, O&G industry value chain etc.	Methane, Nox and Sox reduction
	Electrification	Moving from carbon intensive fuels to renewable energy enabled electricity	

SECTORS	ENABLER TYPE	ENABLING WHAT?	DESCRIPTION
Industry	Green Hydrogen	Zero- emissions fuel > Decarbonization of industry sectors and heavy mobility	
Transport	Battery electric vehicle	Electrification - Expansion/ enabler of electricity-based mobility	
	Battery innovation		New battery concepts etc.
Energy transformation	Bioenergy	More efficient renewable energy	Improved PV cells and concepts etc.
	PV innovation	Storage, delivery, distribution, and scale of net zero fuel	
	Green Hydrogen innovation		
Industry/Energy transformation	Cooper inks	More efficient and economic renewable and energy efficient technologies	Better PV cells production process and performance
	Additive manufacturing - Cooper		
Industry	Additive manufacturing - Metals	Reduction of waste and more efficient metal parts production	Additive manufacturing of metals

* Sectors that are not discussed in this report

IEA CLEAN ENERGY TECHNOLOGY DATABASE

SECTORS	ENABLER TYPE	ENABLING WHAT?	DESCRIPTION
Energy transformation	Power	Generation Storage Infrastructure Production or (Battery) Storage	67
	Hydrogen	Production Transport Storage	45
	Biofuels	Production	29
	Heat	Generation Storage	7
	Synthetic hydrocarbon fuels	Production	5
	Refining	Production	3

SECTORS	ENABLER TYPE	ENABLING WHAT?	DESCRIPTION
Transport	Road	End-use and operations Infrastructure Production (Battery)	37
	Shipping	Infrastructure End-use and operations	20
	Aviation	End-use and operation	8
	Rail	Infrastructure End-use and operations	5
Industry	Chemicals and plastics	Production End-of-life	29
	Battery recycling	End-of-life	28
	Cross-cutting	Production Infrastructure End-of-life	25
	Cement and concrete	Production End-of-life	23
	Iron and steel	Production	18
	Pulp and paper	Production End-of-life	16
	Aluminum	Production	8

SECTORS	ENABLER TYPE	ENABLING WHAT?	DESCRIPTION
Buildings	Heating and cooling	End-use and operations Storage Generation Transport	65
	Buildings construction and renovation	Infrastructure	34
	Systems integration	Infrastructure Storage	8
	Cooking	End-use and operation	8
	Lighting	End-use and operation	5
CO_2 management	CO_2 storage	CO_2 storage	6
	CO_2 transport	CO_2 transport	2
	Direct air capture	Production	2

Endnotes

[1] ETP Clean Energy Technology Guide – Data Tools - IEA

[2] Estimation is based on global investment in energy transition technologies as defined by IRENA

[3] ETP Clean Energy Technology Guide – Data Tools - IEA

[4] ETP Clean Energy Technology Guide – Data Tools - IEA

[5] Some reports indicate 516 as the number of Climate Tech while others indicate upward of 800 It will be imperative to compile a unified metric system to evaluate the ecosystem.

[6] The discerning investor community seeks a reliable blend of quantity and quality, yet many face challenges in conducting the requisite deep, science-based due diligence.

[7] Net-zero Target Status | Net-Zero Targets | Climate Watch (climatewatchdata.org)

[8] Net-zero Target Status | Net-Zero Targets | Climate Watch (climatewatchdata.org)

[9] Badlam, J., Cox, J., Kumar, A., Mehta, N., O'Rourke, S., & Silvis, J. (2022, August 16). The Inflation Reduction Act: Here's what's in it. [Web article]. McKinsey & Company. Retrieved from https://www.mckinsey.com/industries/public-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it

[10] The Green Deal Industrial Plan (europa.eu)

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revenue-estimates-2023-07-27/

[20] Techtime. (2022, September 21). Inviz's revenues will reach 3.3 billion dollars in 2030. [Web article]. techtime.co.il .Retrieved from https://techtime.co.il/2022/09/21/innoviz-39/
It is estimated that the total addressable market for low-emissions assets and offerings for the industry sector will be $250-300 billion annually in 2030 which represents a significant opportunity.

[21] As defined by IEA clean energy technologies

[22] IEA's clean energy technologies required in the industrial sector with high or very high importance include most of these technologies.

[23] International Energy Agency. (2023, March 8). Early-stage venture capital investment in clean energy start-ups by technology area, 2015-2022. Retrieved from https://www.iea.org/data-and-statistics/charts/early-stage-venture-capital-investment-in-clean-energy-start-ups-by-technology-area-2015-2022-3; PwC. (2023). Overcoming inertia in climate tech investing. Retrieved from https://www.pwc.com/gx/en/services/sustainability/publications/overcoming-inertia-in-climate-tech-investing.html

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[26] International Energy Agency. (2021). Net Zero by 2050: A Roadmap for the Global Energy Sector. [Report]. Retrieved from https://www.iea.org/reports/net-zero-by-2050

[27] nT-Tao is building a compact fusion reactor that will generate 10-20 MW of electricity

[28] Eco Wave Power went public on Nasdaq July 2022

[29] IRENA and OEE (2023), Scaling up investments in ocean energy technologies, International Renewable Energy Agency, Abu Dhabi.; Astute Analytica. (2023, August 11). Global wave and tidal energy market poised to reach $10 billion by 2031, report shows. Offshore Energy. Retrieved from https://www.offshore-energy.biz/global-wave-and-tidal-energy-market-poised-to-reach-10-bln-by-2031-report-shows

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[64] Other companies on the list provide ancillary services enabling or supporting these technologies or having a direct contribution to the reduction of energy consumption or the expansion and adoption of clean energy technologies

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