

Scaling Sustainable Innovation: From Research to Commercial Growth

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About



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Executive Summary

This report synthesises insights from a roundtable discussion at the Insights Forum 2024, focusing on scaling sustainable innovation from research to market adoption. The discussion emphasised the importance of bridging the gap between groundbreaking academic research and commercial readiness to address critical global challenges such as climate change and resource scarcity.

Three major themes emerged as critical for closing this innovation gap:

- Addressing funding gaps in research commercialisation
- Scaling the business model for sustainable innovations
- Talents to support the scaling of innovation

Sustainable technologies in sectors such as energy, agriculture, and manufacturing often face significant hurdles in progressing from research to commercialisation. Limited access to capital, challenges in scaling solutions, and a lack of skilled talent were identified as recurring obstacles.

Discussions at the roundtable highlighted the need for new approaches, including innovative financial mechanisms, interdisciplinary collaboration, and targeted skill development programmes. These strategies aim to foster a conducive ecosystem for advancing sustainable technologies, enabling them to achieve commercial success and drive measurable impact across industries. By addressing these challenges collaboratively, stakeholders can accelerate the transition from academic innovation to market-driven solutions, contributing to a more sustainable and resilient future.

Introduction

The pressing need to address sustainability challenges, including climate change and resource scarcity, highlights the importance of accelerating the transition of sustainable innovations from research to commercial application. Discussions at the roundtable covered a range of critical issues, including the creation of collaborative ecosystems, overcoming funding barriers, and developing scalable business models for sustainable technologies. This report distills the key insights and actionable outcomes from these discussions, providing a comprehensive framework for addressing these challenges, supplemented by relevant research findings.

Addressing Funding Gaps in Research Commercialisation

The transition of sustainable innovations from research to commercialisation remains a significant challenge despite the growing urgency to address climate change, resource scarcity, and sustainability goals. Discussions at the roundtable revealed several systemic barriers, including the lack of adequate funding, fragmented innovation ecosystems, and the disconnect between academic research and market readiness. While research institutions focus on discovery, private sector players often prioritise incremental improvements over transformative, high-risk innovations. This disconnect often leaves groundbreaking technologies unable to progress beyond laboratory settings, limiting their potential to create meaningful societal and environmental impact.

The Persistent Funding Gap

A prominent theme of the discussion was the "funding gap" that plagues early-stage ventures in sustainable technologies. Studies show that while venture capital investment reached a record \$620 billion globally in 2021, only 6% of this funding was allocated to clean energy and other sustainable solutions, with most of the investment concentrated in later-stage companies. Early-stage ventures — critical for developing transformative technologies — struggle to secure funding due to the high risks and extended timelines associated with their development cycles. For example, clean tech ventures often

require 10 to 15 years to mature, compared to 3 to 5 years for software startups, making them less attractive to conventional investors seeking quick returns. Case studies such as the Climate Investment Funds (CIF) and the Breakthrough Energy Ventures (BEV) illustrate how patient capital can play a transformative role in addressing this gap. BEV, for instance, manages over \$3.5 billion in committed capital and prioritises technologies capable of reducing global greenhouse gas emissions by at least half a gigaton annually. By combining patient funding with technical and policy expertise, BEV has supported over 110 companies across various growth stages.

Fostering Collaborative Ecosystems for Sustainable Innovation

The roundtable emphasised the importance of building collaborative ecosystems to overcome these funding challenges. By connecting researchers, accelerators, and investors, these ecosystems can create synergies that bridge the gap between research and commercial adoption. One notable example is the US Department of Energy's¹ (DOE) Adoption Readiness Level (ARL) framework, which evaluates whether technologies are prepared for private-sector investment. This framework complements traditional Technology Readiness Levels (TRL) by focusing on market viability and aligning innovations with industry needs.

Singapore's Green Finance Action Plan, spearheaded by the Monetary Authority of Singapore (MAS), is another model of collaboration. The MAS Green Bond Grant Scheme² incentivises private companies to fund renewable energy and green infrastructure projects by offsetting issuance costs. This initiative has helped Singapore position itself as a hub for sustainable finance while mobilising capital for environmental projects.

Policy-driven Support to Foster Commercialisation

Policy support is pivotal in fostering the commercialisation of sustainable innovations by addressing market uncertainties and incentivising private-sector engagement. Effective government interventions, such as subsidies, tax incentives, and procurement programmes create a more predictable environment that encourages investment in high-impact, long-term projects. For example, the Green Climate Fund's Private Sector Facility (PSF) employs blended finance to attract private capital into climate-resilient projects across developing nations. By offering risk mitigation tools and concessional funding, the PSF has enabled the implementation of clean energy and sustainable infrastructure in regions that private investors often overlook due to perceived risks.

Public-private partnerships further amplify the impact of such policy-driven initiatives by leveraging the strengths of both sectors. A notable success is the Climate Investment Funds' (CIF) Clean Technology Fund (CTF), which has mobilised over \$8 billion in concessional funding. This financial support has de-risked investments in renewable energy and energy efficiency projects, making them more attractive to private-sector stakeholders. Beyond funding, these partnerships deliver essential technical and operational expertise, enabling the scaling of transformative solutions.

Driving sustainable innovations requires a multifaceted approach that addresses funding gaps, fosters collaborative ecosystems, and implements supportive policies. By aligning stakeholder interests and leveraging innovative frameworks like blended finance and ARL, it is possible to accelerate the transition of groundbreaking technologies from research to market. Case studies from initiatives such as BEV, CIF, and MAS demonstrate how targeted interventions can de-risk investments, mobilise capital, and create demand for sustainable solutions.

Ultimately, bridging these gaps will require sustained collaboration between researchers, investors, policymakers, and industries. Only by creating an integrated ecosystem can we ensure that sustainable innovations achieve commercial success and deliver tangible benefits for society and the environment.

Scaling the Business Model of Innovation

While addressing funding gaps is critical for early-stage ventures, scaling sustainable innovations requires a focus on building robust business models that enable these innovations to reach commercial viability. Challenges in scaling arise not only from limited funding but also from a lack of market readiness, alignment among stakeholders, and infrastructure to support widespread adoption. The roundtable emphasised strategies to transition sustainable technologies from small-scale implementations to impactful global solutions, highlighting the importance of patient capital, collaborative ecosystems, and emerging technologies in this process.

Challenges in Scaling Sustainable Innovations

Scaling sustainable innovations involves bridging the gap between proof-of-concept and widespread adoption. Participants noted that while many early-stage ventures successfully develop transformative technologies, they



struggle to achieve scalability due to limited demand, fragmented markets, and a lack of operational expertise. This challenge is particularly pronounced for clean tech and sustainable infrastructure projects, which require extended timelines and substantial upfront investments. For instance, data from 2023 on US-based startups reveals that 47.1% of venture capital funding was directed toward later-stage ventures, highlighting the insufficient funding available for early-stage startups to develop and scale effectively (Figure 1).

for underserved markets. Off-Grid Electric's pay-as-you-go solar energy model in Africa exemplifies how tailored revenue streams ensure affordability and long-term financial sustainability.

Market readiness and operational resilience were identified as key pillars of scalable business models. Initiatives like Singapore's Jurong Innovation District provide testbeds for piloting innovations in real-world environments, while

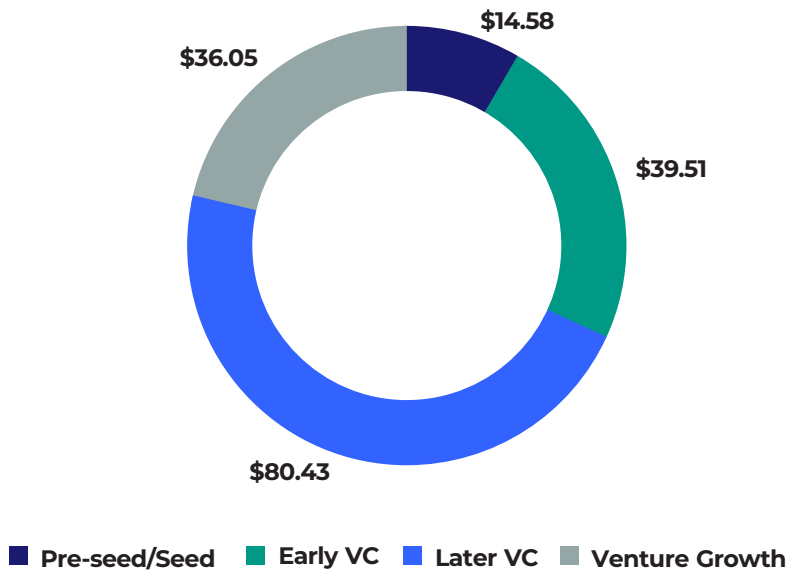


Figure 1: VC funding amount by stages (Source: Pitchbook-NVCA Venture Monitor, 2024)

Robust Business Models: A Key to Scaling

Scaling sustainable innovations requires robust business models that align market readiness, stakeholder interests, and operational resilience with long-term financial sustainability. These models must go beyond addressing funding gaps to integrate sustainability into their core value proposition while ensuring scalability and adaptability. Roundtable participants emphasised the need for business models that balance environmental and societal impact with financial viability, citing principles like the circular economy adopted by companies such as Patagonia and Philips, which reduce waste while attracting investors and customers.

Stakeholder collaboration emerged as a critical enabler for scaling. Public-private partnerships and frameworks like Singapore's Public Sector Data Sharing Framework were highlighted for fostering co-creation and reducing innovation risks. For instance, such partnerships in Singapore have facilitated the development of solutions using shared government data, ensuring market alignment and scalability. Innovative revenue models also play a pivotal role in driving adoption. Performance-based contracts and subscription models were discussed as effective tools to lower entry barriers

technologies like blockchain enhance supply chain transparency and trust. Such approaches validate demand, refine solutions, and prepare innovations for broader adoption.

Creating Demand and Market Readiness

The roundtable emphasised the critical need to build demand for sustainable innovations across diverse market segments, highlighting fragmented adoption as a persistent challenge. While large corporations often spearhead the integration of green technologies, small and medium enterprises (SMEs) frequently lack the resources or incentives to do so, limiting market growth. Targeted public policies, such as tax incentives and procurement programmes, were identified as key mechanisms to stimulate demand & encourage broader adoption.

Singapore's Green Finance Action Plan serves as a prime example of fostering market readiness through strategic initiatives. MAS' Sustainable Bond Grant Scheme, which reduces issuance costs, has successfully incentivised private-sector participation in sustainable projects. This has mobilised capital for green infrastructure and created a ripple effect that encourages adoption across various sectors. By aligning policy

support with market needs, stakeholders can enhance demand and unlock the potential for sustainable innovations to achieve meaningful scalability.

Leveraging Emerging Technologies

Emerging technologies such as artificial intelligence (AI) and big data analytics were identified as critical tools for scaling innovations. Platforms like EQT's "Motherbrain" use AI to analyse vast datasets, identify high-potential investment opportunities, and streamline decision-making processes. Additionally, AI can enhance the operational efficiency of startups by optimising resource allocation, predicting market trends, and improving scalability. For instance, AI-driven analytics have been instrumental in helping startups align their offerings with market demands, thereby reducing the risks associated with scaling.

Scaling sustainable innovations demands a shift from incremental approaches to systemic strategies that integrate patient capital, emerging technologies, and multidisciplinary collaboration. By fostering ecosystems that align stakeholder interests and promote market readiness, it is possible to transition innovations from small-scale pilots to impactful global solutions. Insights from the roundtable underscore the

need for sustained efforts to create robust business models, stimulate demand, and build the infrastructure necessary for scaling sustainable technologies. Through these efforts, stakeholders can unlock the full potential of sustainable innovations, addressing pressing global challenges and delivering long-term societal and environmental benefits.

Talent to Support The Scaling of Innovation

Scaling sustainable innovations is not solely about securing funding or developing groundbreaking technologies — it fundamentally relies on cultivating a skilled and adaptable workforce. This requires multidisciplinary expertise, an entrepreneurial mindset, and visionary leadership to navigate the transition from innovative ideas to impactful, scalable solutions. The roundtable highlighted the necessity of embedding entrepreneurial education into traditional training frameworks, fostering leadership committed to long-term sustainability goals, and building ecosystems that align talent development with the demands of sustainable innovation. By equipping individuals with these competencies, stakeholders



can drive the widespread adoption and success of transformative technologies.

Purpose-driven Leadership

Effective leadership is a cornerstone for scaling sustainable innovations. Leaders must not only align their organisations with ambitious sustainability goals but also foster resilience, adaptability, and long-term value creation within their teams. Participants emphasised that leadership must go beyond technical expertise to inspire collaboration and focus on meaningful, sustainable outcomes. For instance, a Fortune-Deloitte survey³ revealed that 80% of CEOs see a need to redefine leadership roles to better engage diverse stakeholders, reflecting the growing emphasis on leadership as an enabler of both innovation and market success.

Cultivating Entrepreneurial and Multidisciplinary Talent

The integration of entrepreneurial skills within traditional STEM (Science, Technology, Engineering, and Mathematics) education is critical for fostering creativity, critical thinking, and problem-solving capabilities. Roundtable participants emphasised the importance of multidisciplinary approaches to

address complex global challenges, citing examples such as Google's internal mobility programme, which encourages employees to rotate across teams, enabling them to acquire diverse perspectives and broaden their skill sets. This approach not only enhances employee engagement but also equips organisations to tackle multifaceted problems effectively.

Equally important is the development of entrepreneurial ecosystems that bridge academia, industry, and government to cultivate talent and scale sustainable innovations. Successful models, such as Hungary's university-led innovation hubs, demonstrate how collaborative ecosystems can drive the growth of engineering and biotechnology startups, significantly boosting the country's export economy. Singapore Management University (SMU) provides another compelling example, with its Institute of Innovation and Entrepreneurship (IIE) driving innovation through initiatives like the Lee Kuan Yew Global Business Plan Competition and the SMU Business Innovations Generator (BIG). These programmes offer structured incubation, mentorship, funding, and opportunities for global collaboration, helping startups transition from concept to commercialisation.

Expanding access to entrepreneurial education at early learning stages is essential for cultivating future-ready innovators. Initiatives like Singapore's SMU-SST Technopreneurship Programme integrate entrepreneurial training with STEM education, offering secondary school



students a holistic curriculum that combines hands-on workshops, hackathons, and experiential learning. By addressing real-world challenges, such programmes foster critical thinking, sustainable innovation, and leadership, preparing students to tackle pressing global issues effectively.

solutions. These efforts are indispensable for addressing global challenges and driving meaningful progress toward a sustainable future.

Augmenting Human Capabilities with AI

Emerging technologies like artificial intelligence (AI) hold transformative potential in supporting talent development and scaling innovations. AI-powered platforms, such as EQT's "Motherbrain," were highlighted as tools that enhance decision-making, identify high-potential talent, and streamline investment processes. By augmenting human capabilities rather than replacing them, AI fosters creativity and operational efficiency, aligning innovation with market needs and scalability requirements.

The roundtable underscored that talent development is as crucial to sustainable innovation as funding or technology. Purpose-driven leadership, multidisciplinary skills, and entrepreneurial ecosystems are the pillars of success in scaling impactful solutions. By aligning education systems, organisational practices, and emerging technologies with the needs of sustainable innovation, stakeholders can cultivate a pipeline of talent capable of turning ideas into market-ready



Conclusion

The journey from lab to market is fraught with challenges, yet it is a critical pathway for addressing global issues such as climate change, resource scarcity, and sustainable development. The discussions underscore that bridging this gap demands a comprehensive strategy — one that integrates funding innovations, scalable business models, purpose-driven talent, and enabling policies to transform academic breakthroughs into impactful solutions.

Central to this transformation is the creation of robust collaborative ecosystems. By aligning the efforts of researchers, investors, industry leaders, and policymakers, these partnerships dismantle barriers to commercialisation, enabling innovations to scale effectively. Adaptable business models and patient capital emerge as essential drivers, ensuring that long-term, high-impact projects receive the support they need to flourish. Leveraging emerging technologies such as AI and big data further accelerates efficiency and scalability, reinforcing the innovation process across industries.

Talent plays a defining role in this equation. A workforce imbued with multidisciplinary expertise, entrepreneurial skills, and visionary leadership is indispensable for turning concepts into reality. Embedding entrepreneurial education from an early age and cultivating flexibility within organisations nurture the next generation of innovators — those capable of not only advancing technology but also reimagining solutions that meet global challenges.

Ultimately, the path to scaling sustainable innovations is not just a technical endeavour but a human one. By fostering collaboration, aligning financial and societal incentives, and committing to a vision of collective progress, we can bridge the innovation gap. Doing so unlocks the potential of transformative ideas, paving the way for a future where innovation drives sustainability and prosperity for all.

Acknowledgements

Moderators

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Scribe

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Fostering Collaborative Ecosystems for Sustainable Innovation

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Cultivating Entrepreneurial and Multidisciplinary Talent

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