Praise for the Book

'*India's Green Startup* is a rallying cry for action, spotlighting how India's visionary entrepreneurs are confronting the climate crisis with transformative solutions. This book showcases bold innovators harnessing technology to drive clean energy, sustainable mobility and climate resilience. This compelling narrative weaves data with real-world impact, proving that India's green revolution can inspire a global shift toward sustainability. A must-read for anyone committed to saving our planet.' – **Amitabh Kant**, India's Sherpa to the G20 and former CEO, NITI Aayog

'*India's Green Startups* spotlights visionary entrepreneurs that are essential if we are to tackle global challenges like climate change, clean energy and sustainable mobility. Jayant Sinha and Sandiip Bhammer reveal how these innovators are trying to build scalable solutions and cutting-edge technology, to position India as a leader in the global green economy.' – **Vinod Khosla**, Founder and Managing Director, Khosla Ventures

'*India's Green Startups* brilliantly captures the pulse of a new generation of entrepreneurs reshaping India's future. Their groundbreaking solutions are not only addressing climate challenges but are also setting global benchmarks for innovation and impact. This book is a testament to the transformative power of purpose-driven leadership in building a sustainable world.' – **Rajat Gupta**, Senior Partner Emeritus and Former Global Managing Director, McKinsey & Company

'As India's youth take charge, green startups are leading the way. India's Green Startups highlights the bold ideas and vision shaping a sustainable tomorrow.' – **M.S. Dhoni**, Former Captain of the Indian National Cricket Team and Chennai Super Kings, and prominent early-stage investor

'This book captures the remarkable journey of India's green startups, brought to life by Sandiip Bhammer and Jayant Sinha, showcasing their potential to transform the global climate

narrative. Through dynamic and inspiring stories, it charts a path toward a greener, brighter tomorrow, making it a timely and essential read for anyone committed to a sustainable future.' – **Pawan Kant Munjal**, Chairman, Managing Director and CEO of Hero MotoCorp

'In a world grappling with climate challenges, *India's Green Startups* offers a beacon of hope. Jayant and Sandiip eloquently weave stories of resilience and ingenuity, presenting a roadmap for global sustainability driven by Indian entrepreneurship. An important read for leaders and changemakers alike.' – **Dr Soumitra Dutta**, Peter Moores Dean and Professor of Management, Saïd Business School, University of Oxford

'India's green startups tell inspiring stories of ambition, resilience and creativity, tackling pressing environmental challenges while building successful businesses. These journeys serve as powerful inspiration for anyone passionate about sustainability, whether they are aspiring entrepreneurs or venture capitalists seeking impactful investments.' – **Prof. Madan Pillutla**, Dean, Indian School of Business

'This book shines a spotlight on India's green pioneers, showcasing how bold innovation and relentless grit are redefining sustainability. It's a compelling narrative of local solutions with global implications – a must-read for anyone invested in the intersection of entrepreneurship, technology and environmental stewardship.' – **Prof. Tarun Khanna**, Jorge Paulo Lemann Professor, Harvard Business School; Director, Lakshmi Mittal & Family South Asia Institute, Harvard University

'India's green startups are not just businesses – they are bold ideas redefining how enterprises can emerge from a commitment to the well-being of society and sustainability, rising well above crony capitalism in their very essence. This book is a compelling read that introduces new perspectives on green business by Sandiip and Jayant.' – **Ritu Marya**, Editor-In-Chief, India and Asia Pacific, *Entrepreneur Magazine*

India's Green Startups

India's Green Startups

Entrepreneurs That Are Driving Growth

Jayant Sinha
and
Sandiip Bhammer

juggernaut

JUGGERNAUT BOOKS
C-I-128, First Floor, Sangam Vihar, Near Holi Chowk,
New Delhi 110080, India

First published by Juggernaut Books 2024

10 9 8 7 6 5 4 3 2 1

P-ISBN: 9789353458638
E-ISBN: 9789353453572

Typeset in Adobe Caslon Pro by R. Ajith Kumar, Noida

Printed at Thomson Press India Ltd

To Teddy, Aashir, Simran and Rishabh, and Punita with all my love and gratitude.

– JAYANT SINHA

To my father, Mahendra, and my daughter, Rhea – this book is a reflection of your unwavering love and guidance.

– SANDIIP BHAMMER

Contents

Foreword xi

Introduction 1

1. Accacia's AI-Driven Revolution in Real Estate 24
2. How BluSmart is Electrifying India's Ride-Hailing Industry 42
3. RevFin's Mission to Electrify India's Future 55
4. EMotorad's E-Bike Revolution for a Greener Commute 73
5. KisanKonnect's Journey to Greener Agriculture 91
6. How CHUPPS is Redefining Sustainable Footwear in India 103
7. NeoCell Industries' Bold Vision for India's Clean Energy Future 115
8. Zero Cow Factory's Animal-Free Revolution 137
9. Log9 Materials's Bold Leap in Battery Innovation 150

10. ElectricPe's Vision for India's EV Revolution 165

11. Newtrace's Green Hydrogen Revolution 182

12. Zerocircle's Seaweed-Powered Solution to Plastic Pollution 197

13. How Battery Smart is Accelerating India's EV Movement 216

14. Nutrifresh's Farm-to-Fork Hydroponics Journey 231

Afterword 242

Acknowledgements 255

A Note on the Authors 257

Foreword

The Green Tipping Point

India stands at a crucial moment, one that will determine not only its own economic destiny but also its role as a global leader in the battle against climate change. This book – *India's Green Startups: Entrepreneurs That Are Driving Growth* by Jayant Sinha and Sandiip Bhammer – arrives at this pivotal time. It captures the inspiring stories of visionary entrepreneurs who are redefining what it means to innovate, compete and thrive in a green economy.

The facts tell a stark story. Today, India is home to 1.4 billion people, yet it accounts for only 7 per cent of global greenhouse gas emissions. However, this figure is set to rise significantly as our economy continues to grow using fossil fuels. The stakes are enormous: continued reliance on fossil fuels could lock us into a high-cost, high-risk trajectory, while embracing green technologies could unleash a wave of innovation, job creation and sustainable growth.

Why is this shift so urgent? Consider our energy imports: India spends over $200 billion annually on fossil fuels, a

figure that undermines our economic resilience and leaves us vulnerable to geopolitical shocks. At the same time, urban air pollution costs us lives and productivity, while extreme weather events devastate rural livelihoods. The path forward is clear: a transition to a low-carbon economy is not just an environmental necessity but an economic imperative.

As I reflect on the extraordinary entrepreneurial stories chronicled in this book, I am reminded of my own journey at Infosys. Back in the 1980s when we were just starting out, the idea of building global IT companies out of India seemed as improbable as it was ambitious. Yet, with a mix of perseverance, ingenuity and belief in the country's potential, we created an industry that put India on the global map.

This ethos of creating scalable, world-class solutions in the face of daunting challenges is precisely what animates the green startups featured in this book. They, too, are tackling issues of immense complexity – climate change, resource scarcity and environmental degradation –with solutions that are not just local but also global in their impact.

Jayant Sinha, one of the authors of this book, is someone I have had the privilege of knowing and working with for decades. Jayant has always been a well-known technology innovator, combining his deep understanding of real-world strategy with a remarkable ability to execute. Our collaboration began with Nasscom, where we worked on several strategic reports aimed at shaping the future of India's IT/BPO ecosystem. These reports provided the roadmap

for how India could harness IT for economic and social transformation – a vision that has largely come to fruition.

Later, Jayant (when he was Minister of State in the Civil Aviation Ministry) and I teamed up on DigiYatra, an ambitious project that uses biometric technology to create seamless air travel experiences. Alongside the Civil Aviation Ministry, the Unique ID Authority of India (Aadhaar), India's airlines and airports and other partners, we designed a system that is secure, efficient and inclusive. DigiYatra reflects the same spirit of innovation and partnership that underpins the green startups profiled in this book.

Jayant's ability to see the big picture while diving into the details has always impressed me. Whether in technology, policy or now, sustainability, he has consistently been at the forefront of addressing India's most pressing challenges. His co-authorship of this book is yet another example of his commitment to fostering innovation for the greater good.

The entrepreneurs profiled in this book represent the best of what India has to offer. They are tackling challenges that span the entire spectrum of sustainability – clean energy, electric mobility, sustainable agriculture, waste management and beyond. What makes these startups remarkable is not just their technological prowess but also their ability to craft business models that align profitability with purpose.

Take, for example, BluSmart Mobility, which is electrifying ride-hailing in India while addressing chronic urban issues like air pollution and congestion. Or the pioneering efforts of Accacia, which uses AI to help real estate and infrastructure

companies meet their net-zero goals. These startups are not merely solving problems; they are redefining entire industries, demonstrating that climate action and economic growth are not mutually exclusive.

The green startups featured in this book are following a blueprint that we saw emerge during the development of India Stack. India Stack revolutionized how digital public goods like Aadhaar, UPI and ONDC could be used to unlock new economic opportunities and deliver public services more efficiently. These initiatives demonstrate how collaborative ecosystems combining private sector innovation with government policy can deliver transformative results.

These lessons are highly relevant to the green transition. India's green startups are building their own stacks – of solar panels, electric batteries, biodegradable packaging and more – to create a foundation for sustainable growth. Just as UPI unlocked new economic possibilities, these innovations are unlocking the potential of a green economy.

Technology is a recurring theme in the stories featured in this book. Whether it's artificial intelligence (AI), Internet of Things (IoT) or biotechnology, these startups are leveraging cutting-edge tools to achieve breakthrough results. But technology alone is not enough. As I've often argued, the real power of innovation lies in combining technology with scalable business models and enabling policy environments.

Imagine an ecosystem where solar energy is seamlessly integrated with electric vehicles; where agricultural waste is converted into biofuel and where data-driven platforms

optimize energy efficiency across industries. This vision is not far-fetched; the entrepreneurs in this book are already building it.

One of the most exciting aspects of India's green startup ecosystem is its potential to lead the Global South. Climate change is a shared challenge, but its impacts are disproportionately felt by developing countries. India's startups are uniquely positioned to offer solutions that are not only affordable but also scalable across similar geographies.

For instance, innovations in battery swapping and hydroponic agriculture can be exported to other countries in Asia, Africa and Latin America. These solutions, born out of necessity and ingenuity, have the potential to transform global value chains. As this book demonstrates, India is not just a participant in the global green economy; it is poised to be a leader.

While the stories in this book are inspiring, they also highlight the challenges that remain. Scaling green startups requires more than vision and tenacity; it requires an enabling ecosystem. Policymakers, investors and larger corporations all have a role to play in accelerating this transition.

Policy Support: The government must continue to create policies that incentivize green innovation, from subsidies for renewable energy to tax breaks for sustainable businesses. Initiatives like the National Green Hydrogen Mission are a step in the right direction, but more is needed to ensure widespread adoption.

Access to Capital: Green startups often require significant upfront investment, especially in sectors like energy and infrastructure. Impact investors and venture capitalists must step up to provide patient capital that balances financial returns with long-term sustainability goals.

Public–Private Partnerships: Collaboration between the public and private sectors can unlock synergies that neither can achieve alone. For example, government support for electronic vehicle (EV) charging infrastructure can complement private sector efforts to expand electric mobility.

Global Benchmarks: India's green startups must plug into global supply chains and supply the world's most demanding customers. To do so, they will have to ensure that their cost structures and technologies are among the best in the world. We have strived to do that in the highly competitive IT services industry. The green economy will require similar relentless focus on global competitiveness.

The green transformation is not just a challenge for entrepreneurs; it is a challenge for all of us. Consumers must adopt more sustainable habits, governments must set bold targets and businesses must reimagine their operations. The stakes are high, but the rewards are immense. As this book makes clear, India has the talent, the resources and the determination to lead the way.

In the words of Mahatma Gandhi, 'The future depends on what you do today.' The entrepreneurs featured in this book are taking this sentiment to heart, working tirelessly to build a future that is not only sustainable but also inclusive and prosperous. Their stories are a testament to the power of human ingenuity and the resilience of the human spirit.

India's Green Startups is more than just a book; it is a blueprint for action. It reminds us that the solutions to our most pressing challenges already exist – they just need to be scaled, supported and celebrated. I congratulate Jayant Sinha and Sandiip Bhammer for compiling this remarkable collection of stories. It is a timely and important contribution to the ongoing dialogue about India's role in the global green economy.

As you turn the pages of this book, I hope you are as inspired as I was by the ingenuity and determination of these entrepreneurs. They are not just building businesses; they are building a better India – and, in doing so, a better world.

Nandan Nilekani
Co-Founder and Chairman, Infosys and
Founding Chairman, UIDAI (Aadhaar)

Introduction

India's climate tech startups are driving the country towards a sustainable future. Green entrepreneurs are scaling up exciting new products and services for customers daily, reducing greenhouse gas emissions and solving many of the country's waste management problems. These entrepreneurs will generate millions of high-paying jobs, create trillions of dollars of new wealth and help India achieve sustainable prosperity. Their stories can shape your careers and their impact will define India's future.

Green entrepreneurs are creating several large, new green industries in India. If our startups achieve global leadership in these industries, they will become highly successful green unicorns. Some of these new green industries include battery swapping, hydroponic agriculture, solar rooftops, green fuels, waste management and recycling of waste materials, development of alternative proteins and fleet-based transportation services.

Net Zero is Net Positive!

We can only build a *viksit bharat* if we address the multi-dimensional impact of climate change triggered by global warming. Our planet has been steadily warming since we started using fossil fuels – such as coal, diesel, petrol and natural gas – on a large scale in the mid-1700s. Clever inventors in England discovered early on that coal – compressed remains of long-ago forests – burned with a high flame for long periods. These inventors began using coal to run large furnaces and steam locomotives in factories. By the late 1800s, coal-based furnaces drove steam turbines that generated electricity. This sparked the beginning of the Industrial Revolution, which laid the foundation for our modern, electrified economy.

Fossil fuels became even more important in the 1900s during the automotive age. These dense energy sources quickly found uses in transportation. The extraction, refining and distribution of fossil fuels soon led to the rise of major oil companies (such as Exxon and Shell) and oil-rich states (such as Saudi Arabia and Venezuela). The largest oil industry remains in the United States, the world's biggest producer of crude oil.

Crude oil also became a feedstock for plastics and other petrochemicals essential for modern life. Natural gas became vital for producing fertilizers for higher-yielding agriculture and generating electricity via gas turbines.

Fossil fuels power our modern conveniences – air conditioning, refrigerators, electrical appliances, computers, smartphones, cars and planes. But they come with a planetary-sized problem. When we burn fossil fuels, we combine the carbon in these fuels with oxygen from the atmosphere to make carbon dioxide (CO_2). Carbon dioxide is a colourless, odourless gas that gradually accumulates in the atmosphere. Before we started burning fossil fuels, the amount of CO_2 in the earth's atmosphere was about 100–150 parts per million (ppm). Today, it exceeds 400 ppm and continues to rise.*

The accumulation of CO_2 – one of the many greenhouse gases – prevents the sun's heat from escaping into space. Others are far more potent and devastating. For instance, methane is produced by the belching of cows and water accumulated in paddy fields. Agricultural waste also produces methane gas. Methane is also routinely emitted in gas fields through the continual flares that spew up from them. Methane is a hundred times more potent than carbon dioxide in trapping the sun's rays. Pollutants such as sulphur dioxide and nitrous oxide are other potent greenhouse gases. All these greenhouse gases are accumulating steadily in the atmosphere and warming our planet.

How much has the planet warmed? Data on average planetary temperatures has been carefully compiled by several top-notch scientific institutions worldwide concerning this

*'Climate Milestone: Earth's CO2 Level Passes 400 ppm | National Geographic Society'. *National Geographic*, tinyurl.com/2bh4mmcn.

question. They all show the same results. Compared to the pre-fossil fuel era (before industrialization kicked off in 1800s), global warming was slow at first, but is now increasing at an alarming rate. Between 1800 and 1950, the global average mean temperature on the planet only increased by about 0.5 degrees Celsius. Since 1950, the planet has warmed almost a full degree more, so that the average temperature is now 1.3 degrees Celsius more than it was in the pre-industrial era. As we pump more greenhouse gases into the atmosphere, the United Nations has predicted that the temperatures will rise by 3.1 degrees C by the year 2100.

Planet Earth is two-thirds ocean. So mind you, this is a 3.1-degrees increase in the global average mean temperature of our planet. Therefore, land temperatures may increase by well over 3 degrees on an average. These temperature increases become relevant when we start to consider the maximum summer temperatures we will have to face. For example, Delhi reaches 46–48 degrees in May and June. Climate scientists predict that over the next 20–40 years, maximum temperatures in Delhi could reach the mid-fifties! We could have heat waves lasting months with temperatures exceeding 50 degrees Celsius. In May 2024, the temperature in Delhi soared to its highest-ever level at 52.3 degrees Celsius.[*] These temperatures are likely to persist across all

[*] Kumar, Hari, and Mujib Mashal. '126 Degrees in India: New Delhi Sweats through Its Hottest Day Ever Recorded'. *The New York Times*, 29 May 2024, www.nytimes.com/2024/05/29/world/asia/india-delhi-hottest-day-ever.html.

of Northern India. Life without an air conditioner at these temperatures will become almost impossible.

As the planet gets warmer, other climate changes will follow. First, it will get much more humid because hot air can hold more water vapor. The sticky heat of July and August in India will become even more unbearable and it will feel like we are living in a sauna. Higher humidity also means that we will have more water in the clouds, leading to more intense cloudbursts, rainfall, flash floods and waterlogging.

Second, the Himalayan glaciers will melt faster, and this snow melt will lead to brimming rivers and flash floods in our hilly regions. There will be more soil erosion and landslides due to this fast water run-off. With more water in our Himalayan rivers and more intense rainfall, we will likely see much more flooding.

Third, the combination of heat waves and floods will dramatically impact our agriculture. It is likely that our rice, wheat, fruit and vegetable harvests will be disrupted. We are already seeing that apple orchards in Kashmir and Himachal Pradesh have been devastated by higher temperatures and apple production has fallen dramatically. Similarly, other crops may also be affected, leading to erratic food supplies and higher food prices in the country. Our growing population and agricultural sector are already under pressure, so our rural economy may be negatively impacted.

Fourth, we will likely see significant flooding in our coastal cities, such as Mumbai, Kochi and Kolkata. The Arctic and Antarctic ice sheets are melting fast as the planet warms up.

Icebergs are breaking off and then melting into the oceans. The net result is that ocean water levels are rising. Oceanic scientists believe India will likely see a 0.5–1 meter rise in sea levels. As this saltwater rises, our mangrove forests and marshes will be inundated and our coastal cities will have fewer buffers to absorb the seawater.

Finally, warmer temperatures mean more extreme weather events like cyclones and droughts. We will see more cyclones in the Bay of Bengal. Cyclones will also start appearing regularly in the Arabian Sea (which has much more open seas). Cyclones in the Arabian Sea have the potential to be much more destructive because there are many more large cities on India's western coast, such as Mumbai, Kochi and Goa. Cyclones can hit land with waves surging to 2–3 meters, causing massive damage to coastal real estate and infrastructure.

In sum, India must prepare for what climate change will inevitably bring in the next few decades. We need to first adapt to these changes by building a much more resilient economy. Then, we must dramatically reduce our use of fossil fuels so that we move to a net zero-carbon economy.

Many skeptics agree that we need to adapt to climate change, but they also argue that we should not have to reduce our use of fossil fuels. After all, the developed world puts greenhouse gases into the atmosphere by using cheap, abundant fossil fuels. Consequently, India has the right to use fossil fuels to power its growth and development. We should be able to emit as many greenhouse gases as we want. They contend this is the only fair way for the country to develop.

In our view, this argument fails on two important counts. If India keeps emitting greenhouse gases at its current rate, we will become a global pariah. Today, we contribute only 6–7 percent of global emissions, which is well below our global population share of 17 percent.* By 2050, at our current emissions rate, we will account for 20–30 per cent of the world's emissions. Almost all the developed economies are committed to getting to net-zero emissions of greenhouse gases by 2050. China has committed to getting to net zero by 2060. Our major trading partners, such as the US and Europe, may refuse to do business with us because we generate large quantities of greenhouse gases and put the planet at risk. This could have really damaging consequences for our exports, jobs and growth prospects.

More importantly, switching away from fossil fuels is good for our economy. Net-zero emissions are net positive for India! If we do not move away from fossil fuels and towards other energy sources, we will become a high-cost, non-competitive economy. Let's understand how this is happening. Massive Research and Development (R&D) investments and manufacturing capacities have been invested in core 'green' technologies such as solar power, battery storage, efficiency solutions and nuclear power. As a result, electricity generated from these new energy sources is cheaper than from base-load

*Deb, Kaushik, and Pranati Chestha Kohli. 'Assessing India's Ambitious Climate Commitments'. *Center on Global Energy Policy at Columbia University*, 8 December 2022, tinyurl.com/urx99b7t.

coal-fired thermal power. Electric vehicles (EVs) are cheaper to operate than fossil fuel vehicles. Factories that use electric-arc furnaces are more efficient than coal-fired ones.

Green technologies are even more cost-effective when the societal costs of coal mining, air pollution and energy security are considered. Note that we are not including the disaster-related costs associated with global climate change here. Even excluding the enormous damage caused by carbon emissions to the atmosphere, the destruction of forests and wildlife and the health costs of air pollution from fossil fuels, green technologies are far superior to conventional systems. Plus, we have to import almost all our fossil fuels from the Middle East, Russia and the United States. Our fossil fuel import bill is about $200 billion annually, accounting for almost quarter of all our imports! Reducing our consumption of fossil fuels is, therefore, crucial for national security and economic resilience.

Therefore, it is crystal clear that India should move to a green economy as quickly as possible. How will this happen? Who will accelerate our transition to a green economy? Where will the money come from? The answers lie with our outstanding green startups.

Startups to the Rescue

We believe India's teeming startup ecosystem will lead the way in greening India. Their innovative business models can enable us to switch our energy sources from fossil fuels to