

# CleanTech: India

Industry overview भारत



# CleanTech: India

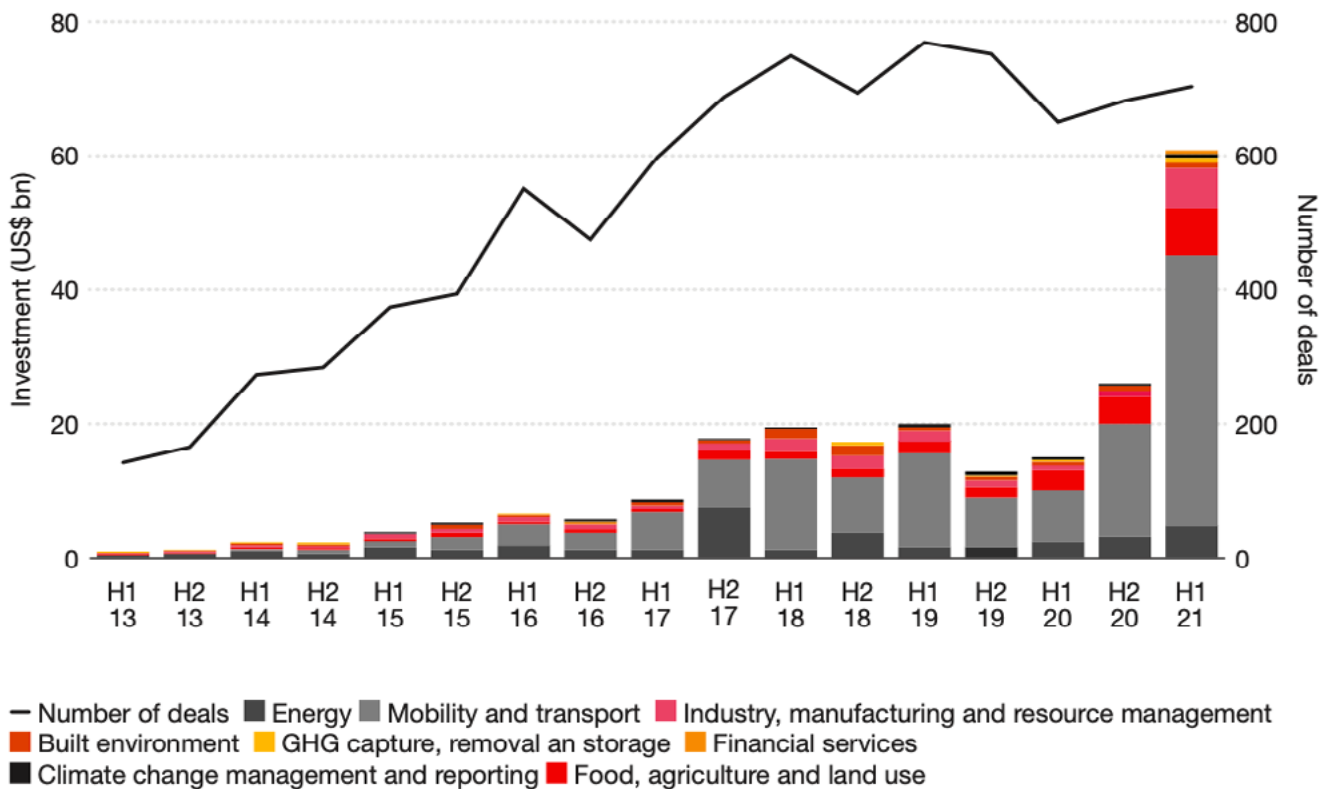
## Abstract

The trends in the Indian CleanTech ecosystem broadly echo the ones in the global landscape, with the dominance of energy and mobility start-ups. However, across different sub-sectors, investors and entrepreneurs in India are paying attention to specific segments that are in line with the country's needs and aspirations. For instance, while the global capital is more focused on clean energy and energy optimisation, startups providing renewable solutions for mass energy access are considered more favourably by investors in India. In 2022, around 143 Indian clean tech startups secured \$2.2 billion in funding, with seed capital as the dominant form of equity infusion (~68% of the deals). ~83% of the deals are for less than \$5 million and account for less than 15% of the total capital inflows in the space. The clean tech ecosystem in India faces a problem of "missing middle", with an urgent need to support startups to scale from their initial prototype to being ready to enter the market. The Government initiatives have made headways in this direction, but private capital is key for the clean tech ecosystem to thrive in India.

**क्लीनटेक**

# Part I

## Overview: CleanTech vertical in India 2022



Global Investment into climate tech start-ups (US\$ bn) and Number of deals  
Source: [PwC State of Climate Tech 2021, analysis of Dealroom data](#)

# Global Trends

## वैश्विक रुझान

Following rapid growth between 2013–2018, climate tech investment plateaued between 2018–2020, as did the wider VC and private equity (PE) market, tempered by macroeconomic trends and the global pandemic. However, climate tech investment growth rebounded strongly in H1 2021, benefitting from latent capital being deployed with an increased focus on ESG.

PwC identified over 6,000 unique investors, including venture capitalists, private equity, corporate VCs, angel investors, philanthropists and government funds. Together, they've funded over 3,000 climate tech start-ups between 2013 and 2021, covering nearly 9,000 funding rounds.

Around 1,600 investors were active in H1 2021, participating in over 700 funding rounds. That compares to fewer than 900 investors active in H1 2020, indicating increasing competition for climate tech deals as the wider investment community becomes familiar with the opportunity of climate tech as an asset class.

The average deal size nearly quadrupled in H1 2021 from one year prior, rising from US\$27m to US\$96m. This was over ten times the size of the average deal in H1 2013. Megadeals (ticket size of more than US\$100m) are also becoming increasingly common, with H1 2021 seeing the first triple-digit number (122).

Globally, the Mobility and Transport challenge area continued to receive the largest amount of funding, as electric vehicles, micro mobility and other innovative transit models continue to attract significant investor attention. Of the ten start-ups that attracted the most investment in H1 2021, eight were in Mobility and Transport.



# Indian trends

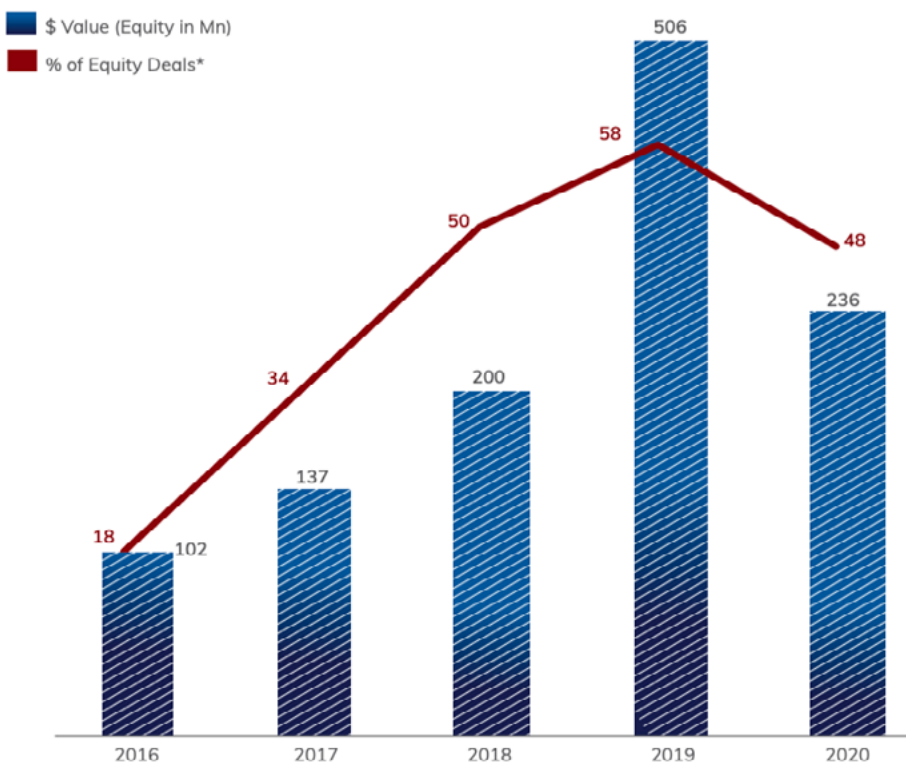
[Home to 2,260](#) clean-tech companies, India currently has the world's **third-largest ecosystem of companies tackling climate change** after the United States (7,561) and the United Kingdom (2,503).

[India ranks at the ninth spot](#) globally for climate tech investment, with the country's early-stage climate tech startups receiving \$1.2 Bn in equity funding from 2016 through 2020. Over the same period, 120 climate tech startups raised over 200 funding rounds from 272 unique investors in India.

To put things in perspective, India's early-stage startup ecosystem as a whole has witnessed a capital inflow of nearly USD55 billion between 2016-2020, of which impact investments account for ~23%. Among the impact-oriented sectors, the infusion in climate tech accounts for 16% by volume (number of deals) and 9% by value.

Seed capital is the dominant form of equity infusion for climate-tech startups in India. Equity infusion at the seed stage accounts for 68% of all deals in the climate tech space between 2016-2020. Moreover, ~83% of the deals are for less than \$5 million and account for less than 15% of the total capital inflows into the climate tech space.

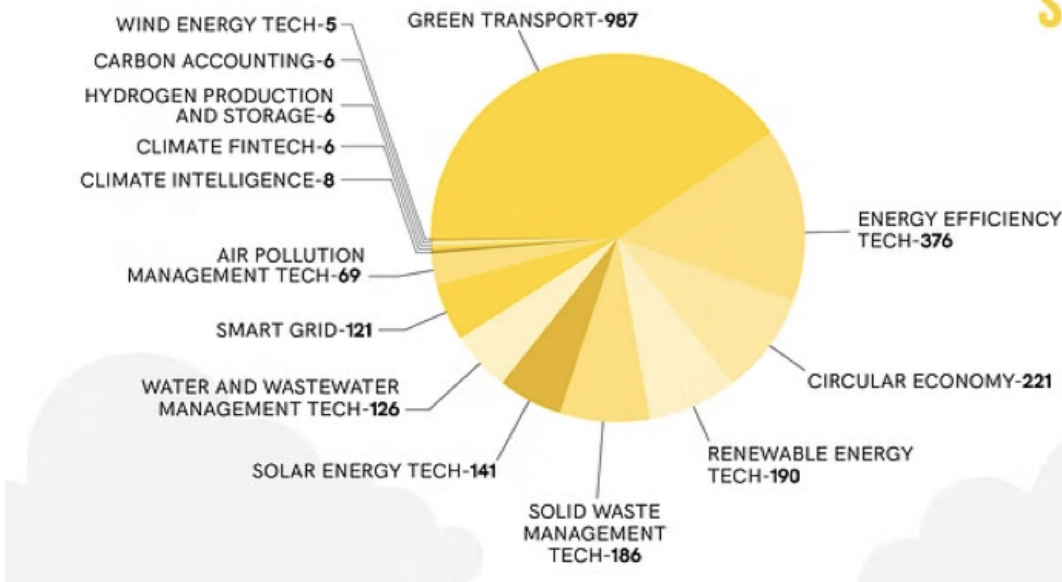
A recent India focused report by [Climate Trends](#) observes that "funding is available for very early stage ideas mainly as grants and for startups that have broken through to establish their business model. The "missing middle" is largely for startups going from the seed stage to scaling up their operations in the market. There is an urgent need to support startups to scale from their initial prototype to being ready to enter the market."



Investment in Climate-tech Ecosystem in India (2016-2020)  
Note: There is an outlier investment (Ola Electric) in 2019. Ola Electric raised about ~USD 300Mn

Source: [Early-stage Climate-tech Startups in India: Investment Landscape Report 2021](#)

# SUB-SECTORS OF CLIMATE TECH OPERATING IN INDIA



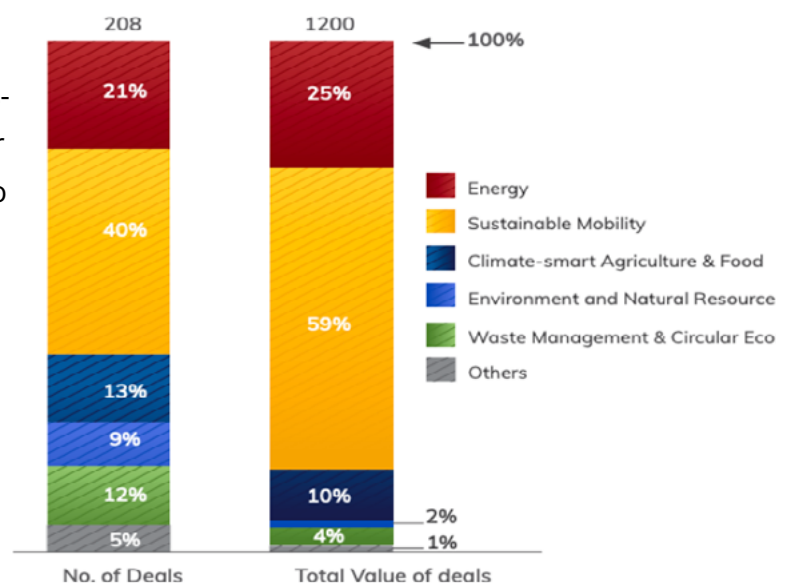
The prominence of energy and mobility startups globally is mirrored in the Indian clean-tech space as well (Figures 2,3). Given their large share of contribution to India’s emissions of GHGs (~70%+), the two sectors have witnessed a favourable policy environment owing to the government’s ambitious climate action commitments and focus on emission reductions. On the other hand, sectors like smart-agriculture, waste management and circular economy, environment and natural resource management are still ramping up in India.

According to an independent study by [CEEW Centre for Energy Finance](#) (CEEW-CEF), the EV market in India will be a US\$206 billion opportunity by 2030 if India maintains steady progress to meet its ambitious 2030 target. The target being: 70% of all commercial cars, 30% of private cars, 40% of buses, and 80% of two-wheeler (2W) and three-wheeler (3W) sales to be electric by 2030. This translates into 102 million EVs, which would require a cumulative

investment of over US\$180 billion in vehicle production and charging infrastructure. In 2021, the Indian EV industry attracted US\$6 billion in investment and is becoming steadily more attractive to private equity/venture capital investors.

With a valuation of \$5 bn as of April 2022, Ola Electric is arguably the biggest success story in the Indian clean tech startup space. It produces electric scooters with AI-enabled robots that claim to offer sustainable and eco-friendly rides to users. The company is also developing electric cars and a battery innovation centre to make its own cell technology.

Investment Split by Value (USD’Mn) and Volume (# of Deals) across climate-tech sub-sectors



# Regulatory situation



**India is acutely vulnerable to the climate crisis and ranked #7 on the Global Climate Risk Index 2021 due to its dependence on rainfed agriculture, a long coastline, and low social safety nets. Studies indicate that India's per capita GDP is likely to shrink 6.4% by 2100 if the rise in temperature continues at the current rate in the absence of large-scale adoption of mitigation and adaptation interventions. At the same time, India's share in global emissions has doubled over the last twenty years (from 3% in 2000 to 7% in 2020).**

In response to the increasingly alarming situation, the Government of India (GoI) has made a series of ambitious climate action commitments. For instance, at the COP26 Glasgow Summit in 2021, India's Prime Minister Narendra Modi [pledged](#) to cut emissions to net zero by 2070, the first time India has set a net zero target. At the same summit, India also pledged to get 50% of its energy from renewable resources by 2030, and by the same year to reduce total projected carbon emissions by one billion tonnes. Under the Paris Climate Agreements, India was one of the largest countries to make commitments that were largely 2 degrees celsius compatible.

In recent years, the GoI has launched initiatives supporting the private sector to ideate and innovate in the climate tech space. For instance, the [Ministry of New and Renewable Energy has launched India Renewable Idea Exchange \(IRIX\)](#), a collaborative platform to exchange and catalyse ideas on Renewable Energy, promote innovation, and enable incubation or acceleration

of meritorious ideas. This platform brings together industry experts, the Global RE community, relevant entrepreneurs and policy makers to drive exponential adoption of innovation in the renewable energy space.

The GoI has recently announced [Production Linked Incentive \(PLI\)](#) schemes pertaining to the climate tech space. These schemes offer turnover linked incentives to approved investors, upon meeting the specified investment, capacity, and turnover criteria. Among these schemes includes the [Advanced Chemistry Cell \(ACC\)](#) scheme, launched in May 2021, for new generation storage technologies. The government has outlaid INR 18,000 crore (US\$2.5 bn) towards the scheme, which is likely to transform many sectors like mobility, grid stability, and consumer electronics. Another such scheme was announced for Production of Electric Vehicles and Hydrogen Fuel Vehicles (PEVHV), towards which the government has outlaid INR 26,000 crore (US\$3.61 bn).

# Foreign VC investors



Foreign Venture Capital Investor (FVCI) is defined under the [Securities and Exchange Board of India \(Foreign Venture Capital Investor\) Regulations, 2000](#) ("FVCI regulations"), and refers to an investor that:

- **Is incorporated and established outside India,**
- **Is registered with the Securities and Exchange Board of India (SEBI) as an FVCI, and**
- **Proposes to make investment in an Indian venture capital fund (VCF) or venture capital undertaking (VCU).**

An applicant seeking registration as FVCI is required to make an application to SEBI in the manner as specified under the FVCI regulations (hyperlinked above). The eligibility criteria for being certified have been listed in Regulation 4 of the FVCI Regulations. A few of the conditions considered by SEBI includes: applicant's track record, professional competence, financial soundness, and experience in the field.

The investment criteria for FVCI have been detailed in Rule 11 of the FVCI Regulations. The Rule provides that an FVCI shall only invest in the following manner:

1. A minimum of 66.67% of the investible funds must mandatorily be invested in the equity-linked instruments or the unlisted equity shares of a VCU.
2. It may invest 33.33% of the investible funds (and not more than that) in:

- Subscribing to the initial public offer of a VCU whose shares are proposed to be listed on a stock exchange
- The Debt or debt instrument of a VCU, if the investor has already made an investment in the VCU by equity
- Subject to a 1-year lock-in period, in the preferential allotment of equity shares of a listed company
- Investment in the equity shares/equity linked instruments of a company that is sick or financially weak, and whose shares have been listed
- In special purpose vehicles, which were made for promoting investments under these Regulations

**It must be noted that the Rule also permits an FVCI to invest 100% of its funds in a domestic VCF registered under SEBI. The investment strategy chosen by the Foreign Venture Capital Investor and the life cycle of the funds must be disclosed to the Board before making any investments in India.**



# वेंचर कैपिटल

**Foreign Venture Capital Investors in India are allowed to invest in the following sectors:**

- **Dairy industry**
- **Poultry industry**
- **Nanotechnology**
- **Biotechnology**
- **Infrastructure sector**
- **IT (software and hardware)**
- **Seed research and development**
- **Production of biofuel**
- **Hotel-cum-convention centres with a seating capacity of more than three thousand**
- **Research and development of new chemical entities in the Pharmaceutical Sector**

A few recent articles that summarise the existing regulatory environment around Foreign Venture Capital Investors:

- **[Guide on the Foreign Venture Capital Investment \(FVCI\) in India](#)**
- **[A Primer on Foreign Venture Capital Investments in India](#)**
- **[India – Foreign Venture Capital Investor](#)**

# Clean energy in India

## स्वच्छ ऊर्जा



Strong social impact lens is driving investor interest in the energy access segment. Startups providing solar / biomass/ biogas powered solutions for energy access have been favoured by impact investors.



With changing dynamics in India's power sector – increasing renewable capacity, introduction of EVs, policies like de-licensing of power distribution – innovations in energy optimization, storage, and management technologies are finding greater demand and attracting greater investments (e.g., Ecolibrium Energy, Ion Energy Labs).



A handful of startups in India are working on emerging innovations in the clean energy space, such as fuel cells and green hydrogen generation & storage solutions (e.g., h2e Power).

Between 2016-2020, the energy access segment has attracted 84% of the total funding into the energy sector of clean-tech, but merely 25% of the total deal flows (Early-stage Climate-tech Startups in India: Investment Landscape Report 2021).

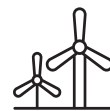
Of the ~400 GW of total installed capacity, renew-



able energy sources in India have a combined installed capacity of 150+ GW. The three biggest sources of clean energy as of August 2022 are Solar, Hydro, and Wind Power, with installed capacity of 59.34 GW, 51.73 GW, and 41.2 GW respectively. With a total installed capacity of 7.4 GW, Nuclear power contributes to ~3% of total power generation in India.



With India's target to reduce the carbon intensity of the economy by 45% by the end of the decade, the clean energy sector in India is expected to create a market worth up to \$80 bn by 2030.



In August 2022, India-based independent power producer ReNew Power announced a partnership with twelve international lenders for what is deemed to be the largest External Commercial Borrowings project finance loan totaling \$1.1 bn in India's renewables sector for any single project. The project comprises 900 MW of wind farms, 400 MW of solar projects, and 100 MWh of battery storage systems.



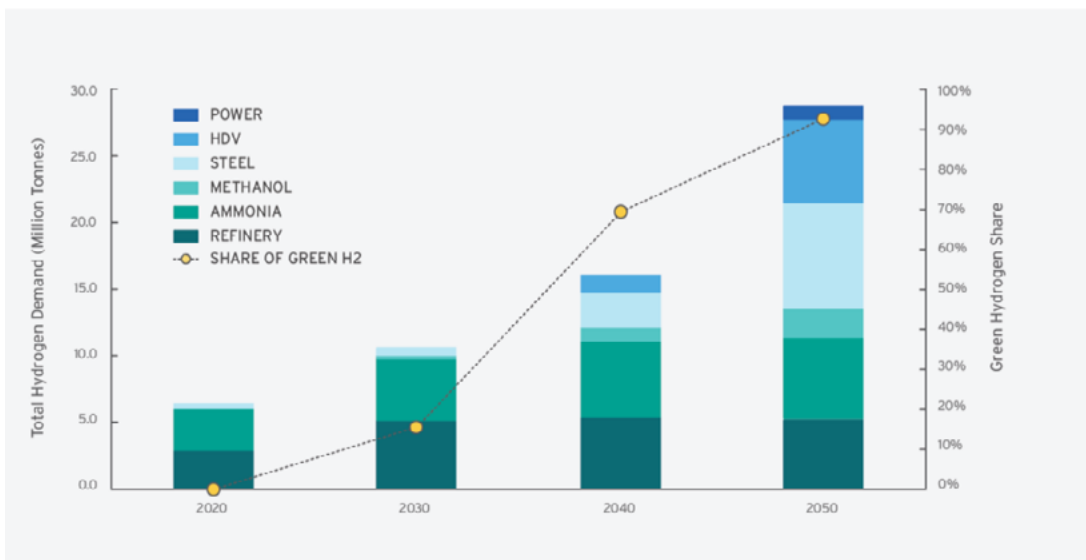
The cumulative value of the green hydrogen market in India could reach \$8 bn by 2030 and India will require at least 50 gigawatt (GW) of electrolyzers or more to ramp up hydrogen production.



Some of the active investors in this space in India are Infuse Ventures, Ankur Capital, FMO, IAN Fund, and SINE.



India is pushing big on Hydrogen, with the launch of the National Green Hydrogen Mission aimed at making India the global hub for the production of green hydrogen. The government has allocated INR 19,744 crore (~\$2.4 bn) for the mission, out of which INR 17,490 crore (~\$2.15 bn) is allotted towards the Strategic Interventions for Green Hydrogen Transition (SIGHT) programme, INR 1,466 crore (~\$180 mn) for pilot projects, INR 400 crore (~\$50 mn) for R&D, and 388 crore (~\$50 mn) towards other mission components.



Hydrogen demand outlook and potential green hydrogen share in India  
[Source: Harnessing Green Hydrogen. Report by NITI Aayog, June 2022](#)

# Sustainable mobility

## सतत गतशीलता



Original Equipment Manufacturers (OEMs) in India are keen to create an indigenous E-Mobility brand, which has attracted investor interest. Despite the high infrastructure costs and barriers, EV manufacturing across various vehicle categories has been backed by investors. This includes e-scooters (e.g., [Ather Energy](#), [Batt:RE](#)), e-motorbikes (e.g., [Tork Motors](#)), 3-wheelers (e.g., [Pi Beam](#)), passenger cars (e.g., [Strom Motors](#)), and cargo vehicle-platforms (e.g., [E-Vage](#), [Euler Motors](#)). Various use cases have also been supported, such as passenger commute and commercial logistics / goods delivery.



[Estimates](#) suggest that India's 2030 vision for e-mobility has the potential to translate into a 158 GWh battery capacity demand, and a network of ~3 million charging points. Startups working with new materials and/or novel battery chemistries, providing scalable charging solutions, and intelligent battery management systems have attracted capital and present an immense opportunity.



Startups offering connected vehicle and fleet management solutions in India have also garnered investor attention. In this space, EV ride hailing and shared mobility solutions (e.g., [Blue Smart Mobility](#), [Smart E](#)) have received investor-backing. Investors have also backed players operating at the intersection of electric mobility and fintech. These startups offer end-to-end services to customers through lease / rental models (e.g., [eBikeGo](#), [Yulu Bikes](#)) for the first and last-mile commute needs – across both B2C (e.g., delivery executives and individuals) and B2B (e.g. last-mile delivery and logistics players) needs.



The sector has witnessed some marquee deals like twenty-two motors raising USD 65 million in 2018 and Ola Electric raising USD 267 million in 2019. Some of the most active investors in this space in India include Hero MotoCorp, Blume Ventures, and Venture Catalysts.

# Part II

## Promising Projects



### Notes on selection

For the purpose of this study, those clean tech startups have been considered which have raised “early” rounds of external equity, typically ranging from seed capital to Series B as of November 2022.

### Key selection criteria used for identifying promising projects:

- Use of proprietary / in-house technology by startups (including those with pending patents), making them promising candidates for being industry disruptors.
- Technical expertise and know-how of founders in the respective domain of innovation. For example, many of the projects identified below are founded by aspiring PhDs with a knack for innovation.

# Startup aggregators

## एग्रीगेटर्स



**Startup India** is a flagship initiative of the Government of India, intended to catalyse startup culture and build a strong and inclusive ecosystem for innovation and entrepreneurship in India. Launched in 2016, the initiative recognises startups spread across all 30 states in India. Pro(s): It is an official source, has a vast database, and is free of charge. Con(s): Contains only basic information about companies ([example](#)), and lacks filtering options during search.

**Ynos** is a business intelligence and analytics platform for India's innovation and startup ecosystem. It has on-boarded over 83,460 startups, more than 5,600 angels, and over 1,500 VCs & networks as part of their exhaustive intelligence. ynos provides customised insights and recommendations to startup founders, venture investors, innovators, and other stakeholders of the startup ecosystem.

**Tracxn** is another great private aggregator for startups in India. It was founded in 2013 by ex-Venture Capitalists and is backed by investors such as Accel Partners and Sequoia. It claims to be one of the world's largest platforms, tracking 1.4 million entities through 1,800 feeds categorised across industries, sectors, sub-sectors, geographies, affiliations and networks globally.

# Startups

## Offgrid Energy Labs

**Last Funding:** Seed (Feb 2022); Undisclosed amount  
Developer of energy storage technology designed to offer cost-efficient and safe batteries for stationary as well as mobility applications. The company's ZincGel battery technology offers maintenance-free renewable energy storage, lowest battery life-cycle cost for microgrids, higher range alternatives for electric vehicles, and improved capability for grid balancing. It outperforms conventional energy storage batteries in terms of power density, life, and cost efficiency. Moreover, ZincGel batteries are sustainable and democratize materials that are recyclable and non-flammable.

## Log9 Materials

**Last Funding:** Series B (Sept 2022); \$10 million  
Log9 is a deep-tech nanotechnology company that develops and manufactures graphene battery cells. The company has developed technology to solve and commercialise sustainable energy storage across applications such as rapid charging battery pack solutions for electric vehicles, long-lasting stationary storage solutions for short-term power backup, the storage of energy on a grid scale, and supercapacitor deployment in standalone applications or in hybrid applications, enabling various clients to use these batteries to save cost and the environment.

## Gegadyne Energy

**Last Funding:** Series A (Jan 2021); \$5 million  
A deep tech startup developing batteries through patented advanced Nanomaterial composites, as an eco-friendly alternative to Li-Ion batteries. Their unique technology allows charging at

unprecedented rates (0-100% in 15 minutes), has longer cycle life, and higher energy density. The company states that its markets include: Electric vehicles, Consumer electronics, Grid storage, and Telecom towers.

## GODI India

**Last Funding:** Seed (July 2021); \$3 million  
GODI is a first-of-its-kind company based in India that is innovating across all verticals of green energy storage technology. The company's efforts are to develop ground-breaking materials with unique cell chemistries, superiorly engineered Li-ion cells, Na-ion cells and Supercapacitors by using environmentally friendly electrode making processes and Recycling of spent batteries towards a carbon neutral Giga-scale manufacturing. It recently became the first Indian company to be certified for its lithium-ion cells, developed using indigenous technology. The [startup claims](#) to have received orders worth \$200 million from EV manufacturers in India, Europe, and the US, and \$50 million worth of orders for stationary storage systems.

## ION Energy

**Last Funding:** Seed (July 2021); \$3.6 million  
Offers an advanced battery management system (BMS) and intelligence platform that improves the life and performance of lithium-ion batteries powering EVs and energy storage systems. Their software-first, full-stack approach blends advanced electronics, machine learning and AI. It's a unique electronics platform-as-a-service (PaaS) model that provides transparency in technology, 30-40% savings in costs and enables customers to buy or build custom BMS models.

# स्टार्टअप

## **NewTrace Private Limited**

**Last Funding:** Pre-Seed (June 2022); \$1 million  
Founded in 2021 by two PhD engineers, NewTrace has developed a way to make green hydrogen production at least 5X cheaper than traditional methods. Newtrace essentially sells its proprietary, patent-pending electrolysers to companies looking to set up their own green hydrogen production plants, as well as a few other value-added services including maintenance. Startup also wants to expand into providing long-term storage solutions for green hydrogen in the future.

## **h2e Power**

**Last Funding:** Seed (Feb 2015); \$200K  
h2e Power manufactures fuel cell-based power generators intended for stationary and mobility applications. The company's systems are capable of co-electrolysis to produce syngas, green ammonia, and other value-added alcohols, e-fuels like kerosene and diesel along with high-value waxes that meet the combined heat and power demand of commercial, residential, telecommunication and agricultural market segments, thus providing clients with decarbonized and defossilised resources for industrial purposes. It is among just a handful of companies in the world that produce solid oxide electrolyzer.

## **Green Joules**

**Last Funding:** Series A (June 2021); \$4 million  
GreenJoules specialises in making renewable Biofuels, commonly recognized as "Drop-in Fuels", which are curated entirely from agricultural residue and renewable wastes from agro processing industries. The fuel can be used as

a 100% replacement for diesel, both industrially and commercially. In addition to being carbon neutral, the company claims that the biofuel produced using its indigenous technology may cost up to 10% cheaper than conventional diesel.

## **Sea6 Energy**

**Last Funding:** Series B (Aug 2021); \$18.5 million  
Sea6 Energy was formed to develop renewable energy solutions by utilising the endless potential of the ocean to develop eco-friendly land alternatives. Its primary focus is to derive ethanol fuel from seaweed and convert it into biofuel. The company has developed a proprietary cultivation mechanism called the SeaCombine, which can simultaneously harvest and replant seaweed in deep ocean waters, enabling cost-competitive production at scale. The company has also developed proprietary technologies to convert fresh seaweed into environmentally friendly products for a range of industries including agriculture, animal health, food ingredients, bioplastics and renewable chemicals.

## **Uravu Labs**

**Last Funding:** Seed (Aug 2022); \$2 million  
Uravu Labs has developed a patent-pending, 100% renewable water technology which utilises inexhaustible, atmospheric moisture and renewable energy to produce high-quality drinking water. Founders see several large-sale applications, from small, portable devices that can be used in small communities like villages, to industrial-size machines that can generate water for the beverage sector. The devices can be as small as 20-100 litres and as large as 10,000-litres.



# Part III Specialised Funds and Hubs



## **Micelio Funds**

Fund Corpus: \$20 million

Claims to be India's first venture capital fund exclusively targeted at enabling radical and sustainable innovation in the clean mobility ecosystem. Micelio Fund typically focuses on 'Pre-Seed' to 'Series A' investments in early stage startups across the clean mobility spectrum – OEMs, infrastructure providers, component suppliers, and service providers.

## **Transition VC**

Fund Corpus: \$50 million, including a greenshoe option of \$25 million.

Claiming to be India's first energy transition-focused VC fund, Transition VC launched its maiden fund in November 2022. With ticket size ranging from \$500K to \$1 Million, the VC fund plans to invest seed capital in 40 early-stage startups, over the next 3 years, across sectors undergoing transition such as E-Mobility, Green Hydrogen, Energy Storage, Net Zero journey in Buildings and Climate-tech.

## Climate Angels

An angel investment syndication platform for pollution reduction and climate tech startups. The Fund is stage agnostic, and boasts of being backed by India's leading Entrepreneurs, VCs, and Investors. Some of the sectors in which the network invests include Clean Mobility / Energy / Agriculture / Water. Climate Angels is a part of [GoMassive](#), a Global Wealth Management system that operates through its investment platform Climate Angles Fund and through its Open Innovation Programs at GoMassive Earth Network.

## Avaana Capital

An early-stage venture capital platform investing across climate and sustainability thematic areas including energy, resource management, mobility, supply chains, food security and sustainable consumption. The fund invests in early-stage, pre-Series A companies.

## Climate Seeds

Venture fund set up for seed and pre-Series A stage investments in promising climate tech startups in India and the rest of South Asia. The investments will primarily be made in startups that have progressed through the accelerators run by [Climate Collective](#) Foundation, the fund's non-profit acceleration partner, which has been supporting startups in South Asia since 2016. Climate Seeds is also building a global follow-on Linked Funding (Series A) network. The fund's key Clean Energy partner is [New Energy Nexus](#) (USA), along with a host of supportive follow-on linked-funding partners.

- Additional Climate focused VCs in India include [Infuse Ventures](#), [Factor\(e\) Ventures](#), and [Sangam Ventures](#).
- The ecosystem of climate-tech in India also hosts several Incubators and Accelerators, including [Social Alpha](#), [India Accelerator](#), [New Energy Nexus](#), and [Huddle](#).





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