



India Climate Tech Startup Landscape



EXECUTIVE SUMMARY

The report landscapes India's current climate tech startup ecosystem. These climate tech solutions are addressing critical challenges in India, the world's 7th most vulnerable country to both the causes and impacts of climate change. Highlighting the current market size and growth potential, the report defines the Indian climate tech startup ecosystem - represented by over 800 operational climate tech startups and over \$3.6 billion raised between 2014-2024 - to be a rapidly expanding market with substantial financing needs.

The study reveals that while early-stage funding is relatively robust, with two-thirds of funded startups securing seed rounds, there's a noticeable gap in growth-stage capital. Less than 3 percent of the startups have raised Series B or beyond, indicating a need for more substantial later-stage investments to help promising solutions scale.

The report investigates five climate tech themes:

- Energy Generation & Consumption - 128 startups building solutions around energy efficiency, renewable energy, energy storage, etc. for the energy value chain.
- Food & Agriculture - 66 startups building solutions such as farm analytics, agri-inputs using biotechnology, etc.
- Transport & Mobility - Almost half (~350+) of India's climate tech startups are building for the mobility, largely personal electric mobility value chain. The transport and mobility sector also stands out for attracting about 85 percent of all climate tech funding.
- Industry & Industrial Decarbonization - More than 75 startups largely building solutions for decarbonisation and carbon trading, energy efficiency, and alternative materials.
- Waste Management & Circularity - About 110 startups building solutions for waste management and circular economy including waste to value, increasing traceability and transparency in the waste value chain, and wastewater management.


Considering the market size, initial validation of the problem statement and solutions, funding available, and policy and ecosystem support, the report suggests five promising themes for climate tech innovations in India.

- **Decarbonization** - India's decarbonization market is projected to reach \$10.3 billion by 2032. Opportunities exist in carbon capture, utilisation, and storage (CCUS) technologies, driven by industrial demand and government initiatives to reduce emissions.
- **Circularity and Waste-to-Value** - The \$15 billion waste management industry in India, bolstered by government funding, offers significant potential for circular economy solutions. Key areas include recycling technologies, waste-to-energy systems, and innovative materials.
- **Alternative Fuels** - This sector spans multiple high-growth markets: electric vehicles (\$637.85 billion by 2032), green hydrogen electrolyzers (\$78 billion by 2050), and biofuels (\$10.31 billion by 2030). This diverse landscape offers numerous opportunities for startups.
- **Climate Finance** - India's climate finance need is estimated at USD 1 trillion over the next decade. Recognising this, the Union Budget 2024-25 proposed developing a taxonomy for climate finance with a goal to enhance available capital. However, most private and government sector climate finance is largely available in small ticket sizes that are suitable to early stage companies, at best. There is a visible absence of climate finance options that startups can leverage for scaling up their offerings and achieving growth. This presents an opportunity for innovative financial instruments and blended finance solutions.
- **Climate Tracking and Reporting** - Growing demand from government bodies and corporates for data-driven climate action tools creates opportunities in air quality monitoring, disaster management, and biosphere tracking. Integration of AI and IoT in climate data analytics offers further potential for high-value solutions.

The inclusion of 800+ startups, ~USD 4 billion in funding, and 50+ unique technology products across mitigation, adaptation, and resilience triad paint a promising picture of the domestic climate tech startup ecosystem. Technology, innovation, and entrepreneurial grit demonstrate potential to respond to climate change, globally.

Table of Contents

Executive Summary	01
01. Estimating India's Vulnerability to Extreme climate	06
02. India's Emission Map	07
03. India's Response to Climate Change	08
04. Indian Climate Tech Startup Ecosystem	12
The Big Five - Categories of Climate Tech Startups	15
05. The Emerging Opportunities	52
Acknowledgements	60
References	61
List of Abbreviations	65



**By 2030,
the cumulative cost of adapting to climate change in
India will be about INR 85.6 lakh crore* (\$1.71 Tn^).
This is over 40% of India's current GDP'.**

Ministry of Environment, Forest and Climate Change

* At 2011-12 prices

^ INR 1 = USD 0.02

' Current GDP estimate USD 3.93 Tn

How can technology and innovation make a dent in India's climate challenges? What does the Indian climate tech startup ecosystem look like? What is its way forward?

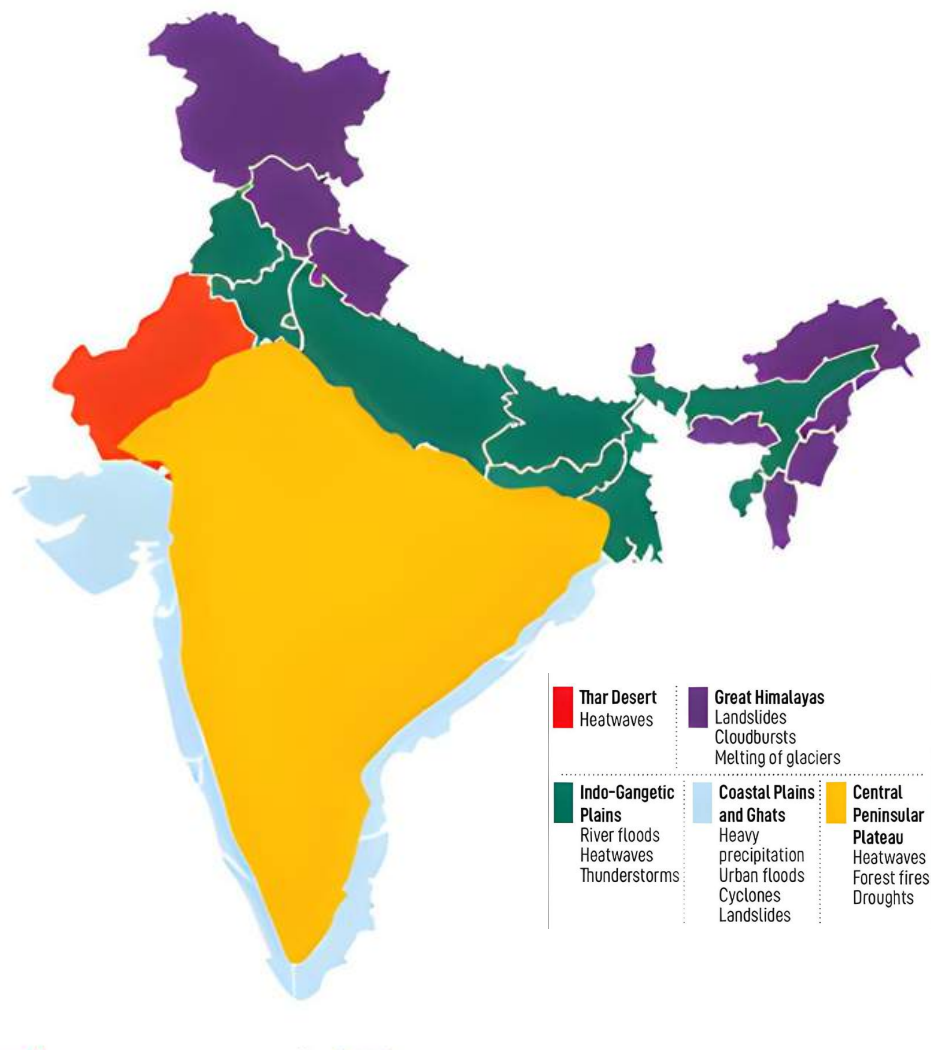
This report seeks to answer these questions.



ESTIMATING INDIA'S VULNERABILITY TO EXTREME CLIMATE

Home to about 17.8 percent of the world's population, India is the **7th most vulnerable country** to climate extremes. This will impede leveraging the demographic dividend and limit the country's growth prospects.

- ▶ **45%** of the population (~638 Mn) lives in places that are extreme climate event hotspots.
- ▶ **80%** of India's population is **highly vulnerable** to extreme disasters like floods, draughts, and cyclones. This is largely because of **human-induced microclimate change** and **lack of infrastructure planning**. **14 states** affected by floods caused by intense rainfall in 2019, causing around 1.8 Mn people to be displaced.
- ▶ **273** days between Jan - Sep 2023, India experienced extreme weather events, leading to a loss of **2,923 lives**, destruction of **80,000 homes** and death of **92,000 animals**.
- ▶ **70%** of India's water is **contaminated**. Unsafe water is estimated to cause **200,000 deaths per year**. The demand for water is expected to **double by 2030**.
- ▶ **2%** labour productivity decreases for every one-degree rise in annual temperature. Average annual temperature has **increased by 1.18 degrees celcius** between 2013 and 2022
- ▶ **40%** of global job losses from heat stress by 2030 (34 Mn) could be accounted for by India.

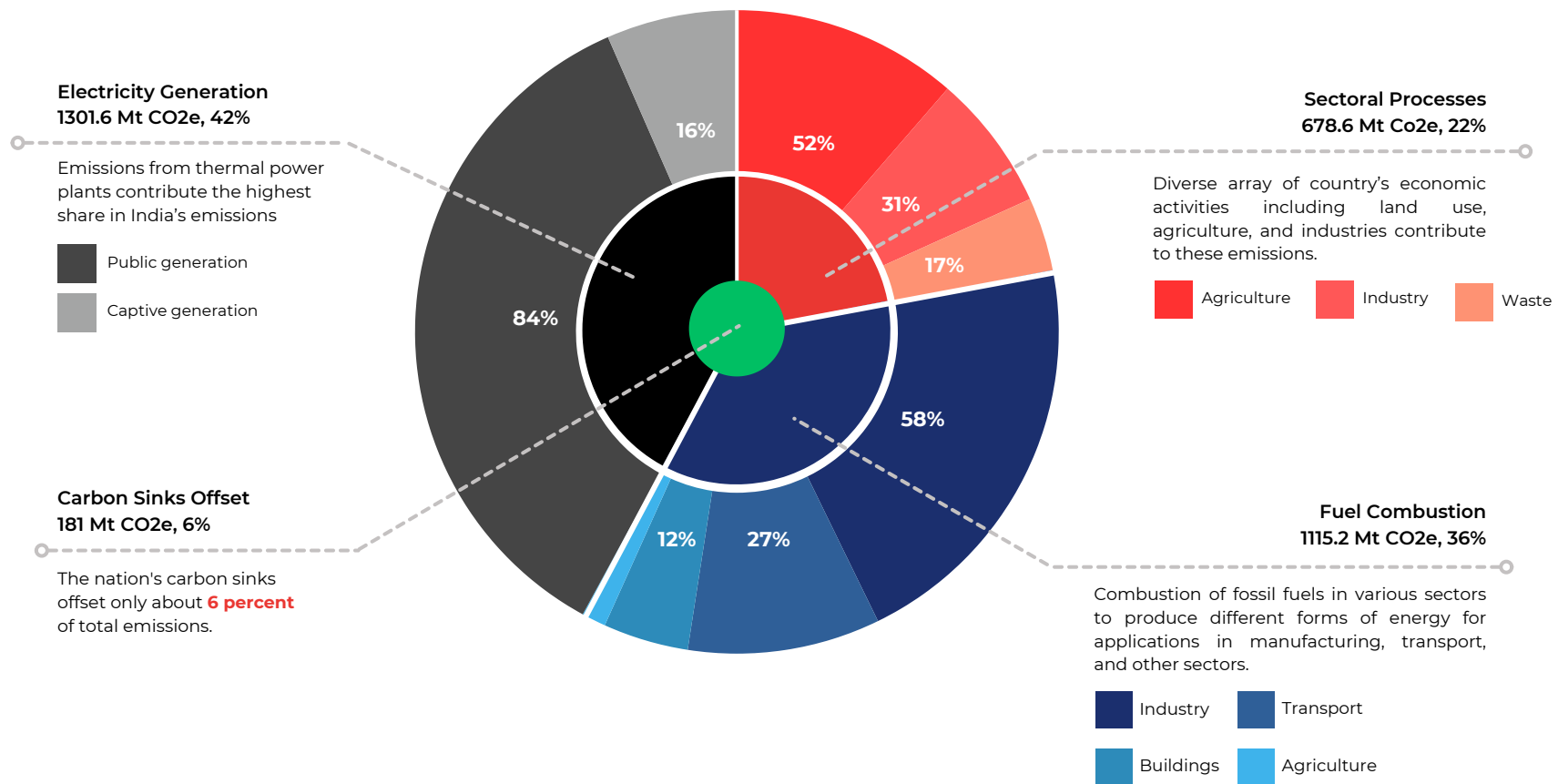


Source: DEPR, RBI covered by Sultana, 2023. Size not to scale
Map only for representational purposes and doesn't represent India's political boundaries.

INDIA'S EMISSION MAP

India is the 3rd largest emitter of CO₂e, globally.

Total Emissions: 3095.3 Mt CO₂e (2018)



How to read the graph:
Electricity generation, sectoral processes, and fuel combustion contribute to the nation's emissions (represented by the inner ring), about 6 percent of these are offset by the nation's carbon sinks (represented by the circle in the middle, size not to scale). The outer ring represents the various sources that cumulatively make up the pieces of the inner pie, and the percentages represent their share in the respective segments of the inner pie.

Source: IIMA Ventures' analysis on data from GHG Platform India



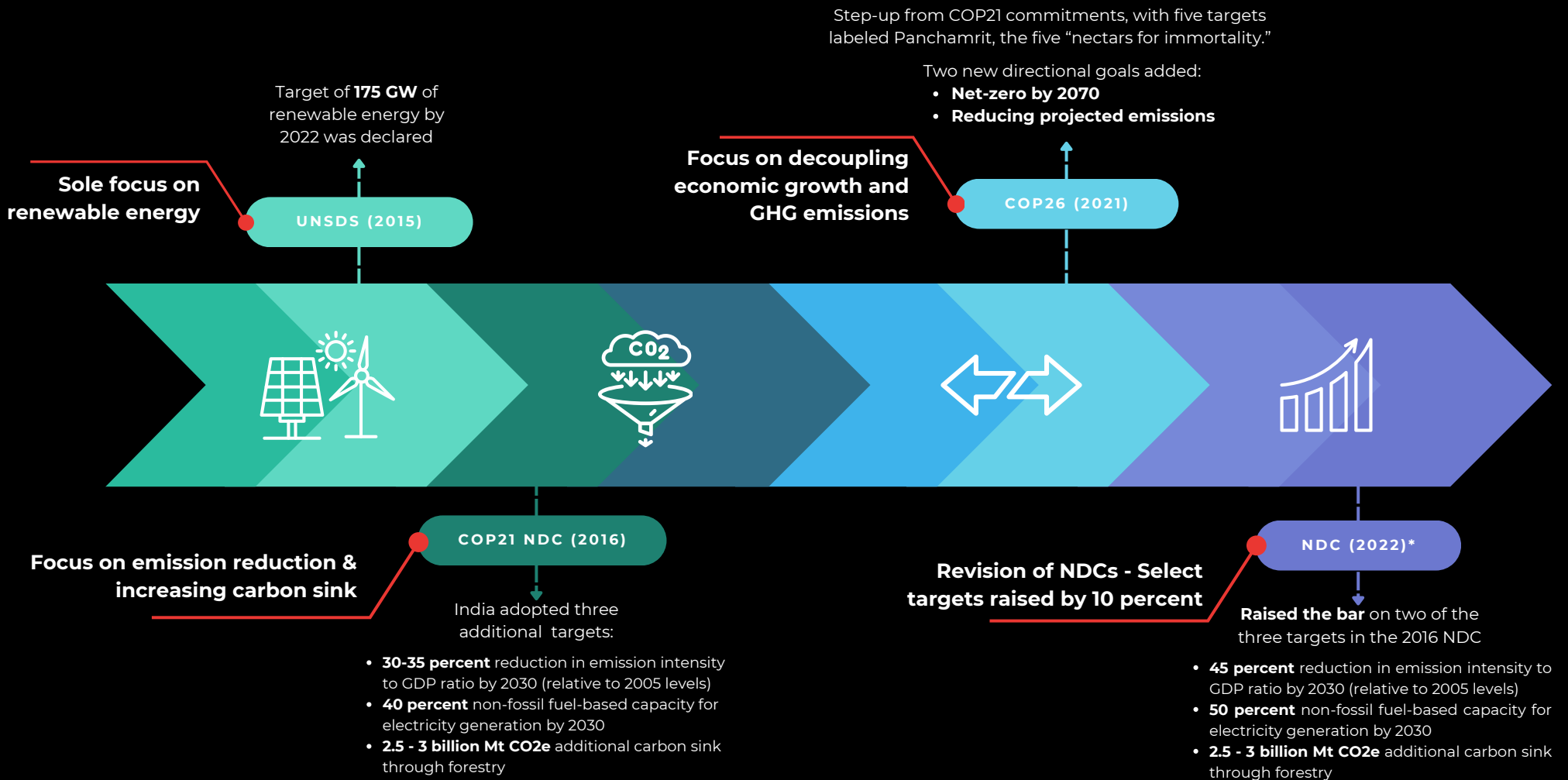
INDIA'S RESPONSE TO CLIMATE CHANGE

DECARBONISATION ACHIEVEMENTS

All is not lost.
India has made some
headways in decarbonisation
across sectors and value chains.

- ▶ Total energy savings (from **Building Energy Efficiency Program**) of over 653 GWh till November 2021, leading to avoided emissions worth 536K t CO₂
- ▶ Total energy saving of 4.226 Mtoe in the **Iron and Steel sector** between 2012 to 2020, amounting to emission reduction of 20.247 Mt CO₂e
- ▶ 79,975 **solar agricultural pumps** have been installed as of March 2022, resulting in energy savings of 6,6 Mn KWh energy and 4,909.74 tCO₂ of emission reduction
- ▶ In 2020-21, 6.44 MtCO₂ of emission reduction was achieved through **Ethanol Blended Petrol** Program
- ▶ Saving of 97 Mn litres of fuel and emission reduction of about 242 Mn Kg of CO₂ were achieved between 2015-2017 through **FAME - I**
- ▶ Reported growth of 118 percent in GHG removal by **carbon sinks** between 2000 - 2019.
- ▶ Over INR 48,000 crore (USD 5.7 Bn) have been disbursed till January 2021 under the **Compensatory Afforestation Fund Act, 2016** to carry out afforestation activities.

EVOLUTION OF INDIA'S CLIMATE COMMITMENTS 2015-2024



Source: (Deb & Roy, 2023)

*These NDCs were adjusted via an August 2022 NDC update. There has been no updates to the NDCs since then.

| CURRENT DECARBONISATION INITIATIVES

While most of the interventions are driven by the center, state administrations are beginning to take initiatives beginning with maintaining climate trackers.

Currently, 33 states and union territories have a **State Action Plan on Climate Change (SAPCC)**. These are tailored to address unique challenges and vulnerabilities for each state.

Additionally, the Department of Science and Technology (DST), Government of India has also set up **State Climate Change Centres (SCCCs)** 'to undertake vulnerability assessment, training programmes, public awareness and institutional capacity building'. These are **operational in 12 states** - J&K, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Nagaland, Manipur, Meghalaya, Mizoram, Tripura, Sikkim, West Bengal and Assam.

IEA Database of Climate Policies

According to International Energy Agency's database, there are around at least **210 in-force policies** and/or measures in India - **160 national, 44 state, 6 others**.

8 National Missions under National Action Plan on Climate Change

- ▶ National Solar Mission
- ▶ National Mission for Enhanced Energy Efficiency
- ▶ National Mission on Sustainable Habitat
- ▶ National Mission for Sustaining Himalayan Ecosystems
- ▶ National Water Mission
- ▶ National Mission for a Green India
- ▶ National Mission for Sustainable Agriculture
- ▶ National Mission on Strategic Knowledge for Climate Change





INDIA CLIMATE TECH STARTUP ECOSYSTEM

INDIAN CLIMATE TECH STARTUP ECOSYSTEM

“Climate tech includes technologies that help mitigate, adapt to and build resilience towards the challenges posed by climate change.”

With 800+ startups and less than \$4 bn in funding, the Indian climate tech startup ecosystem is just about finding its place in the world.

Between January 2014 - March 2024

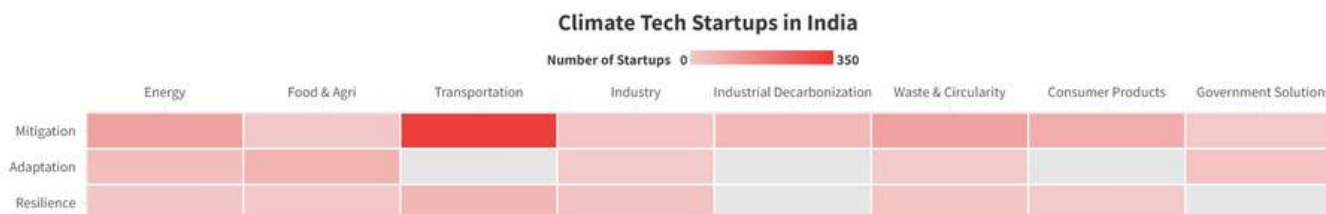
- ▶ More than 2600 climate tech startups were registered, about 800 of them are currently operational.
- ▶ Only 1 out of 4 startups (~220 startups) have raised capital. The total funding was about \$3.6 Bn; During the same period, fintechs in India raised \$19.3 Bn (~6 times over!).
- ▶ More than 2/3rd of all funded startups (~150) have only raised a seed round.
- ▶ Only 20 startups (<2.5 percent of all startups) have raised growth stage funding (Series A+)

Leading Climate Tech Investors



* **Mitigation** - Solutions that are reducing emissions
Adaptation - Solutions that are allowing people to adjust
Resilience - Solutions that are helping recover faster from climate impact

OVERVIEW OF CLIMATE TECH STARTUPS IN INDIA

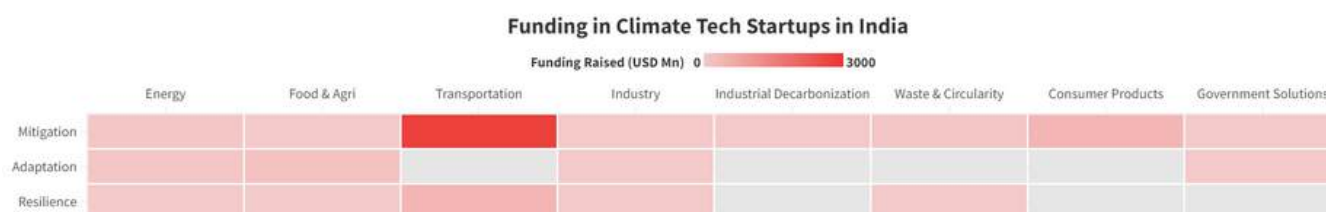
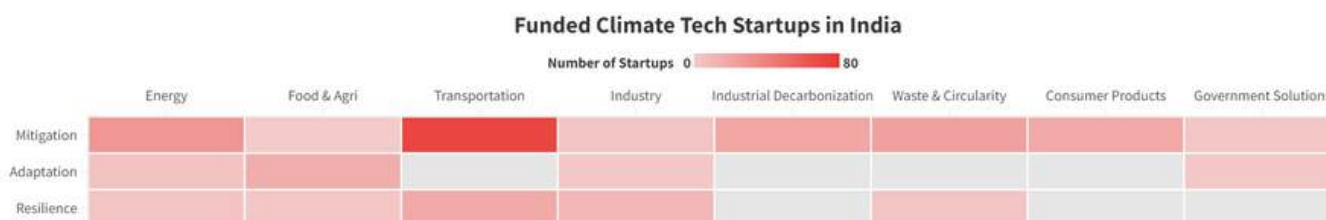


Over 80 percent of climate tech startups are building emission reducing products (i.e. **mitigative solutions**) with sparse work on building resilience products, despite India facing acute climate vulnerability.

The **transport sector** (or mobility), contributes ~10 percent of national emissions and has the highest number of startups and most funding raised.

Despite there being a high number of solutions that are adaptive or mitigative (specifically in Waste & Circularity and Consumer Products), no investment activity is seen in those areas. This could be a sign of **limited investor confidence** in the viability and scalability of such solutions.

The **greyed out boxes do not necessarily symbolise a gap entirely**. For example, solutions under Industrial Decarbonisation can only be mitigative as they are designed for emission reduction / removal.



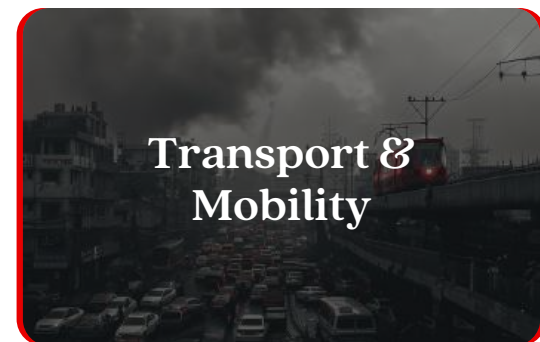
Source: IIMA Ventures' Analysis

How to read the graph:

This graph indicates the density of climate tech solutions via three unique parameter (number of startups, number of funded startups, amount of funding raised) across the grid of types of climate action (mitigation, adaptation and resilience) and the space of climate action (various industries, consumers, government).

The gradient in red indicates the level of climate tech activity whereas the grey boxes represent an absence of action in the space. The intersection of Transportation and Mitigation shows most activity across all three parameters.

We look at the **five** big categories of **climate tech startups**,
in context of the gap and the problems they are attempting to solve





ENERGY GENERATION & CONSUMPTION

DEMAND FOR ENERGY

The demand for energy has jumped by **50.8 percent** between 2013 and 2023. Over the next five years, this is expected to grow 1.5 times to **366 GW** from the current **243 GW**.



More than 700 heat waves
over past five decades;
loss of more than 17000 lives

*Increasing
incomes*



3x growth in AC
ownership since 2010

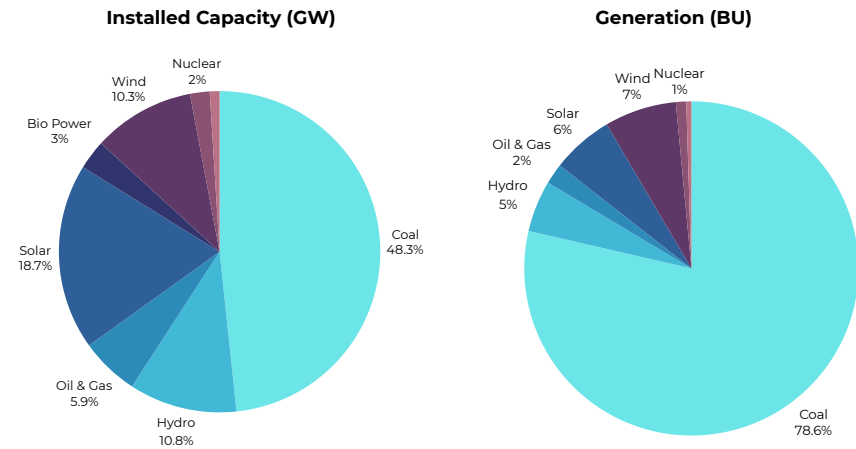
Between 2022 and 2025, the energy demand for running household air conditioners alone is expected to increase by 9x!

Over the next two decades,
India is likely to account for
25 percent of the global
energy demand growth.

UNWAVERING DEPENDENCE ON COAL

The world's largest coal producer and emitter is an Indian company which provides employment to over 200,000 people. A scaling down in mining operations will entail job losses and financial stress for the last mile employees.

While coal accounts for about 50 percent of the nation's installed capacity, its share in energy generation is nearly 80 percent



Source: India Climate & Energy Dashboard, NITI Aayog
Total Installed Capacity: 442.87 GW, Total Energy Generation: 152.27 BU
Numbers indicate percentage share of total

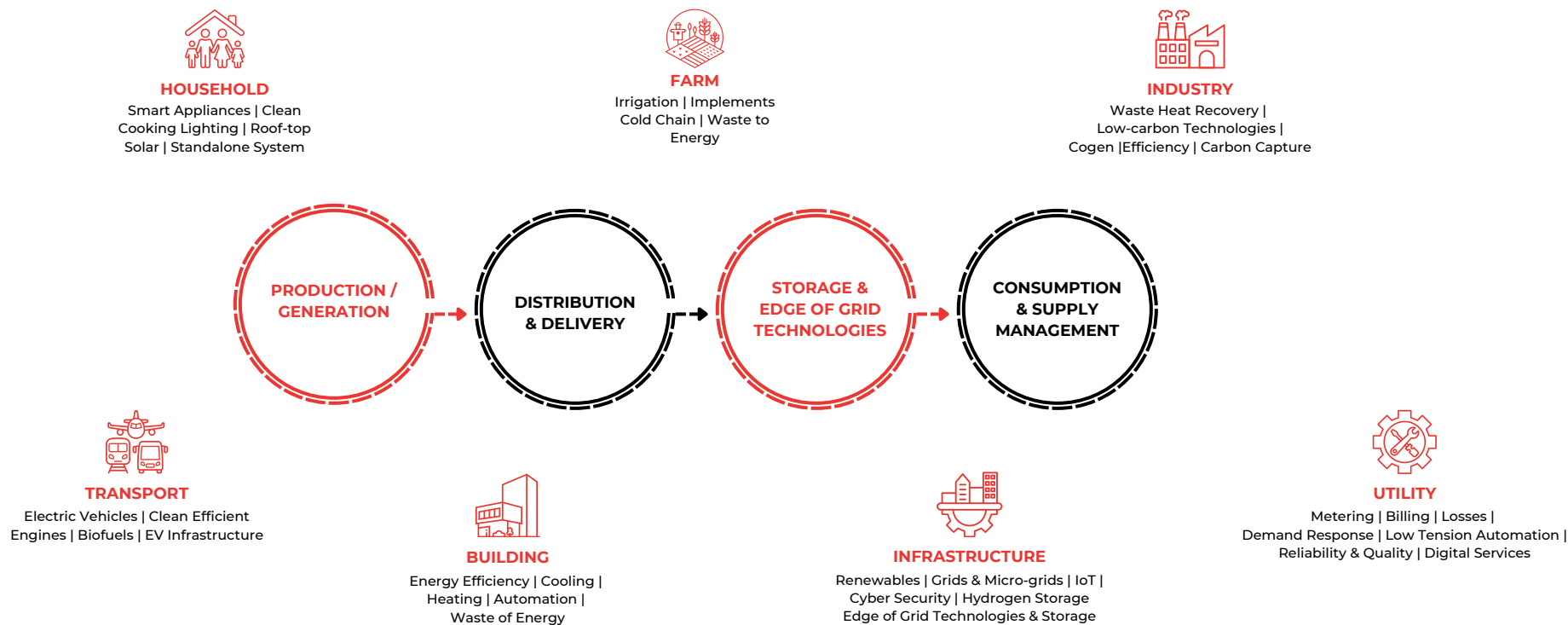
CASE STUDY - COAL INDIA LIMITED

The state owned PSU Coal India Limited is recognised as a *Maharatna*. It has 322 mines and is the largest producer of coal in the world. It is also the largest emitter in the world. In 2016, it topped the national list, but was also identified as one among '*250 largest emitters*', globally.

As the country transitions towards renewable energy, the company is likely to face a heavy impact from layoffs. The company employs around a *quarter of a million people*. Over the last few years, the staff count has been reducing about *13000 to 14000 people being laid off per year*. This rate of layoffs is likely to accelerate resulting in massive job loss by 2050.

INDIAN CLIMATE TECH STARTUPS ARE BUILDING A RANGE OF SOLUTIONS ACROSS THE ENERGY VALUE CHAIN.

The energy value chain in India faces several challenges, resulting from climate change, such as reduced efficiency in thermal and renewable power plants due to rising temperatures, vulnerability of power transmission systems to extreme weather events, degradation of energy storage performance in harsh climates, strain on grids from increased cooling demands, etc. The energy sector also faces risks from rising sea levels and increased flooding to coastal infrastructure, potential disruptions to hydroelectric power due to changing rainfall patterns, and the need for more resilient grids to handle intermittent renewable energy sources.



Source: Clean Energy International Incubation Centre (CEIIC), Social Alpha



**128 startups building solutions for the energy value chain;
less than a third have raised USD 150 Mn**

EMERGING SOLUTIONS

INFRASTRUCTURE READINESS FOR INCREASING DEMAND

Meeting the increasing demand and increasing the share of renewable energy, while improving efficiency, will require certain infrastructural changes like smart grid, efficient transmission lines, integrating RE into the public grid, etc.

Climate tech startups are solving for two distinct problem statements - **management of demand and energy storage**.

The time lag between energy generation and usage has often come in the way of widespread adoption of renewable energy sources like solar. Climate tech startups are showing promising advances in battery technology which will be able to address this gap for a variety of customer groups including DISCOMS, commercial entities and households. Several startups are also building solutions to monitor and forecast energy demand, essentially allowing smarter decision making with insights on peak load time, distribution losses etc.

TRANSITIONING TO RENEWABLE ENERGY

About 45 percent of India's installed capacity comes from renewable energy sources, predominantly solar. The **uptake for solar energy** is bolstered by incentives and subsidies offered by the state governments. Finally, the technology is becoming commoditised and/or cheaper. Climate tech startups working on the transition problem statement, are predominantly offering-

- Solutions around energy transition as a service encapsulating the entire process from load assessment to design and installation.
- Most startups are, however, involved in manufacturing and distribution of solar PVs.
- While wind and hydropower account for minimal startup activity, nuclear power too has no startup activity.

REDUCING INEFFICIENCIES IN THE ENERGY VALUE CHAIN

In 2022-23, **over 15 percent of the power generated was lost** under AT&C losses. At the same time, about 20 - 30 percent of electricity is wasted in Indian households.

Startups are building monitoring, measurement/estimation and reporting solutions for DISCOMS, industries and households. IoT sensors and computer vision is commonly deployed to monitor and machine learning to analyse the data and make recommendations.



STARTUP CASE STUDIES - ENERGY GENERATION AND CONSUMPTION



Energy Management

Founded in 2014, **Smart Joules** is on a mission to eliminate energy waste. Its solutions make energy efficiency simple, substantial and profitable through a cooling-as-a-service business model, intelligent automation technologies, and efficiency-first processes. It provides solutions for existing building structures in terms of both hardware and software to reduce electricity consumption. The startup raised a total funding of USD ~6.5 Mn primarily from European Development Finance Institutions, ADB Ventures, Sangam Ventures, and Intellevestures, among other investors.

Reported impact: 190 crore energy costs saved, 23.55 crore kWh energy saved, and 1.64 lakh tonnes CO2 emissions eliminated.



Solar PV

Founded in 2010, **Fourth Partner Energy** is a renewable energy firm focusing on building and financing solar, wind, hybrid, battery storage, and e-mobility projects/ solutions for commercial, industrial, and institutional entities.

It is a full-service Renewable Energy Services Company (RESCO) that offers end-to-end capabilities including evaluation, design, planning, procurement, construction, operation, maintenance, and financing of critical solar infrastructure. The startup raised a total funding of USD 289 Mn from Norfund, British International Investment, responsibility, The Rise Fund, and Infuse Ventures, among other corporate and angel investors.



Energy Storage

Founded in 2015, **Inficold** designs and manufactures cold storage, milk cooler and air conditioner with grid resilient and off-grid solar integration options, and PCM packs/pouches. These systems have inbuilt thermal energy storage to provide fast cooling rates, short precooling times, and cooling redundancy during power failure.

The startup has raised a total funding of USD 2.84 Mn from Sangam Ventures, Soonicorn Ventures, Rajasthan Venture Capital Fund, 1955 Capital, GJNX Ventures, and Ceramet Consultants.



STARTUP CASE STUDIES - ENERGY GENERATION AND CONSUMPTION



InclusiveEnergy



Infrastructure Management

Founded in 2016, **Prescinto** offers an AI powered asset performance management solution for solar, wind and energy storage. It claims to improve clean energy asset performance by up to 7 percent. The startup raised has a total funding of USD 15.7 Mn from Gensol, LetsVenture, Venture Catalysts, IPV, Pegasus, among other investors.

Reported impact: 10x ROI on APM spend, deployed across 16+ GWs of Solar & Wind projects across 14 countries.



Energy Storage

Founded in 2020, **GODI** claims to be innovating across all verticals of energy storage technology. The company's efforts are to develop unique cell chemistries, superiorly engineered lithium (Li)-ion cells, sodium (Na)-ion cells and supercapacitors by using environmentally friendly electrode making processes and recycling of spent batteries towards a carbon neutral Giga-scale manufacturing. The startup has raised a total funding of USD ~2.5 Mn from Blue Ashva Capital.



Energy Transition

Founded in 2016, **Zunroof** provides solar energy and IoT smart energy solutions to homeowners, institutions, real estate & corporate players. It offers a complete solar solution with the option of net-metering PV system and battery-backed hybrid system. The startup has raised a total funding of USD ~6 Mn from Godrej Industries, Paipal Ventures, Intellectap Impact Investment Network, among other angel investors.

Reported impact: 40k+ customers, saved Rs. 600 Mn on electricity bills, across 75+ cities.





FOOD AND AGRICULTURE

CLIMATE VULNERABILITY OF AGRICULTURE

The agriculture sector is most vulnerable to climate change. Climate change will impact over **45 percent** of India's population that is engaged in the sector. The reduction in output will hit the country's GDP by about 15 percent.



Land & Soil



Livestock



Current Status

120 Mn hectares affected by land degradation

535 Mn livestock population in 2019



Expected Impact

Climate change will affect soil structure and nutrients, thus impelling more chemical use to maintain output levels.

Negative impact such as decreased feed availability & quality, heat stress, diseases, & increased mortality from extreme climate events

Climate change related threats to agriculture are also likely to cause a second order impact on the economy of the country in the form of **reduced farm outputs and incomes, impoverishment of farming households and increased urbanization and stress on cities.**

Government of India's economic survey (2018) estimated that the annual loss of USD 9-10 Bn as due to the adverse effects of climate change on agriculture.

THE AGRICULTURE VALUE CHAIN

Agriculture continues to play a crucial role in India's economy, contributing **18.6 percent** to the nation's GDP in fiscal year 2021-22 and providing livelihoods for **over 45 percent** of the population. This sector plays a pivotal role in propelling the country's overall growth and development. With **over 30 percent of agricultural practices reliant on irrigation**, the management of the energy-water-food nexus becomes a critical concern for the future sustainability of agriculture in India.

Despite the food and agriculture sector significantly contributing to emissions - accounting for about 13 percent of national emissions - the sector visibly **lacks emissions mitigation solutions**. Given the scale of potential impact of climate change on the agriculture sector, **resilience building solutions** like crop insurance are critical.

Agriculture Value Chain	Source	Produce	Transform and Make		Retail
Value Chain Components	Farm Inputs	Farming, cultivation & harvesting	Distribution & transportation	Post-production processing & handling	Retailing/selling
	Seeds Crop Protection and nutrition Agronomy services	Soil enrichment Seed planting Nourish & protect Harvest Transport Sell	Transportation, warehousing Processing and refining Food manufacturing Cold storage Packaging		Traditional trade Grocery Food service E-commerce
Intermediaries	APMC Market/Private Mandi	Banks/NBFC's	Wholesalers	Modern Traders	
	Traders	FPO, Co-operatives	Kirana Stores	Logistic Players	

Source: IIMA Ventures

EMERGING SOLUTIONS

BIOTECHNOLOGY HOLDS PROMISE

Agri biotechnology is addressing issues such as soil protection and regeneration, crop nutrition and disease prevention, crop shelf life increase, etc. **Commercialisation of cutting-edge research** is enabling farmers to safeguard their produce and improve their incomes.

The National Family Health Survey (NFHS) 2022 found that 70-85 percent of Indians follow at least a partially non-vegetarian diet. A highly promising deployment of biotech is lab grown meat (cultivated or plant based) which could potentially reduce the burden on livestock and emissions caused by the industry. However, despite a large market and promising technology, lab grown meat products are yet to take off in India.

SPARSE WORK ON CURBING AGRICULTURAL EMISSIONS

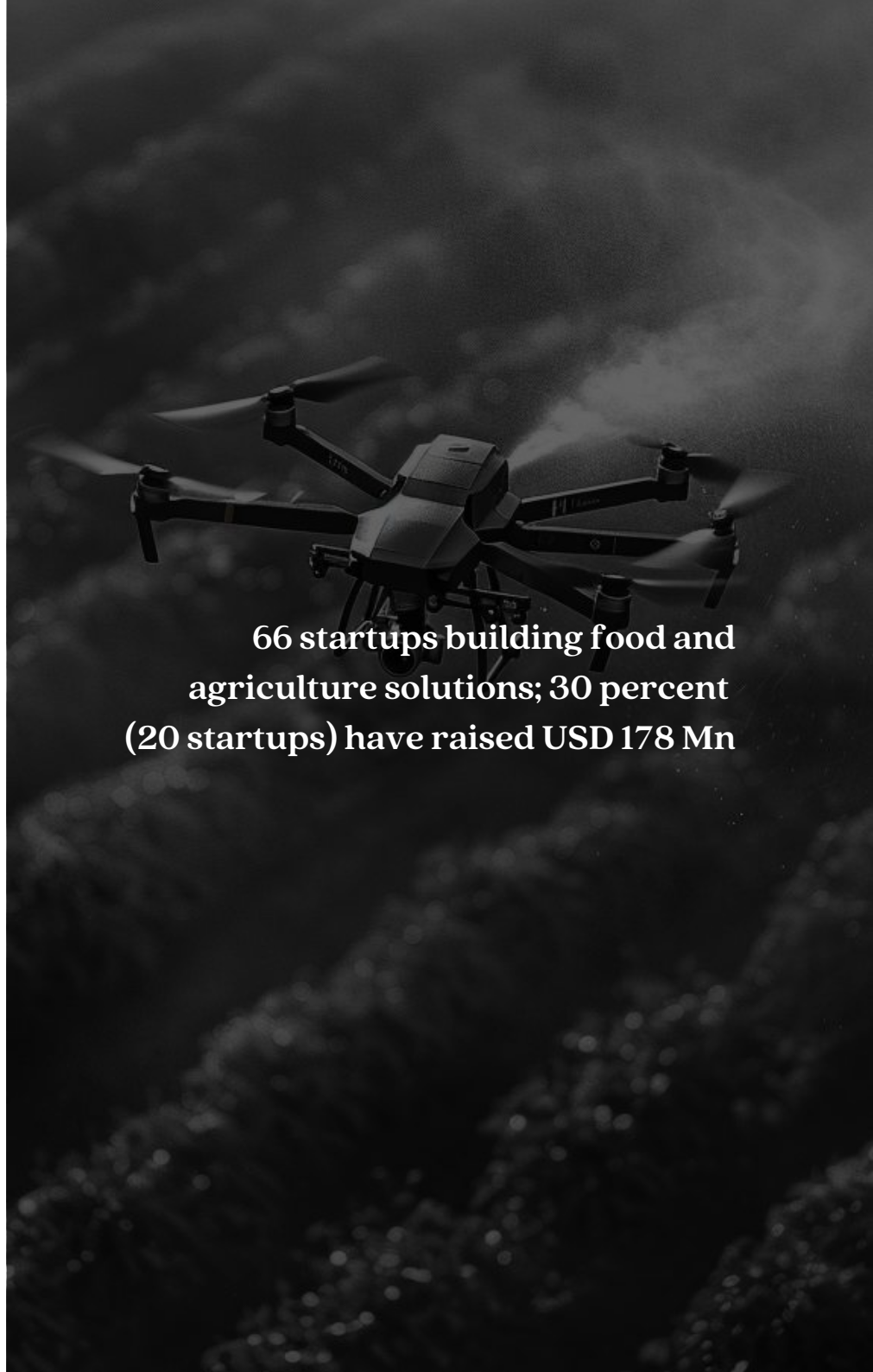
Solutions for largest sources of agricultural emissions - enteric fermentation and rice cultivation (60 percent and 20 percent of agricultural emissions respectively) - exist at the lab stage, at best. While some research is being done towards improving animal feed with a goal of reducing enteric fermentation from livestock, rice cultivation; the **scope of startup intervention is limited** to non-existent here.

Current emission mitigation efforts are focused on shifting to renewable sources of energy to power various equipment's. This is a small part (less than 2 percent of national emissions) of the problem.

SOLUTIONS FOR SUSTAINABLE AGRICULTURE

Precision agriculture as a solution is centred around efficient use of resources, choosing sustainable alternatives for inputs, safeguarding against crop diseases, and increasing overall yield.

A combination of **digital** - artificial intelligence, advanced analytics, computer vision, etc. - and **non-digital** - drones, IoT sensors, robotics - technologies are being leveraged to deliver these solutions.



66 startups building food and
agriculture solutions; 30 percent
(20 startups) have raised USD 178 Mn

STARTUP CASE STUDIES - FOOD & AGRICULTURE



Precision Agriculture

Founded in 2015, **Absolute** has a variety of solutions as part of its agri products portfolio. 'Upaj' by Absolute is a data-driven analytics solution improving farm productivity. They collect & collate data from satellite, IoT devices & soil biomarking and generate actionable insights through proprietary models to enable value creation across the agri landscape.

The company has raised a total funding of over USD 115 Mn from leading investors such as Alpha Wave, Sequoia Capital, LetsVenture, and Peak XV Partners among others.

Reported impact: 1.7 Mn+ farmers reached, 50K+ soil data points analysed, 250+ APIs developed.



Solar Powered Farm Equipment

Founded in 2015, **Khethworks** builds solar-powered irrigation systems that enable small-plot farmers to cultivate year-round.

Khethworks works with livelihoods organizations and farmers in Jharkhand, West Bengal, and Odisha to deploy and test pilot systems. The startup claims that their solution has led to increased incomes and even summer season harvests.

The startup has raised a total funding of USD 124 K from Social Alpha, GIST Network, MIT, Villgro, Sangam Ventures, and AIC Sangam.



Cultivated Meat

GoodDot, founded in 2016, offers plant based meat to the Indian consumer. It is offered and distributed as a selection of various meals wherein the meat has been replaced with plant grown meat.

The startup has raised investments from Sixth Sense Ventures, Unovis Asset Management, YMS Finance amongst others. It was recognised by PETA India and received the Trailblazing Business Award, 2017.



STARTUP CASE STUDIES - FOOD & AGRICULTURE



Precision Agriculture

Founded in 2015, **Niqo Robotics** is solving for crop care spraying in agriculture through their flagship AI powered 'Spot Spray Technology' made possible by a proprietary agriculture camera. It also offers a mechanical weeder to weed between plants.

The company has raised a total funding of over USD ~22 Mn from Bidra Innovation Ventures, Omnivore, Blume Ventures, among other investors.

Reported impact: 100K+ acres sprayed, 50+ drones units shipped, and 2K+ farmers onboarded.



Crop Management

Founded in 2016, **BioPrime AgriSolutions** provides an array of agri - biological products which promotes active growth, boosts crop's defense against biotic / abiotic stress and increase in quality and quantity yield.

It also offers a bioactive consortium* with nano components for growth and overall development and technical services for agriculture such as seedling nurseries, open field crop fields, and tech-integrated poly houses.

The startup has raised a total funding of USD 2 Mn from Inflexor and Omnivore, among other investors.



Precision Agriculture

Founded in 2016, **BharatRohan** empowers Indian agriculture sector through its unique UAV / drone based hyperspectral remote sensing and artificial intelligence.

The startup has raised a total funding of USD 2.8 Mn from RevX Capital, Venture Garage, Villgro, Caspian Equity, Maruna Exports, among other investors.

Reported impact: 26 percent increase in profit for farmers, 32 percent reduction on input costs per acre of farmers, 19K+ farmers enrolled and 50K acres of farmland covered.



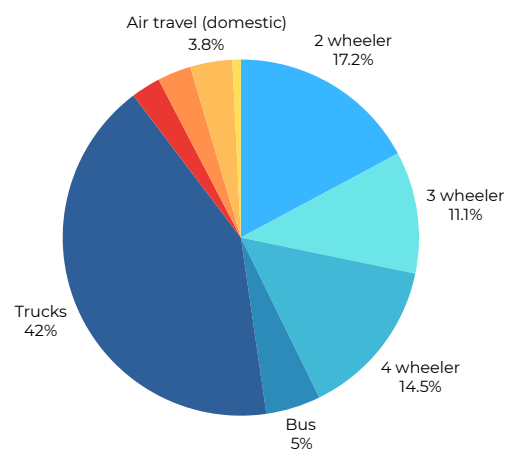
* Refers to two or more bacterial or microbial groups that act together.



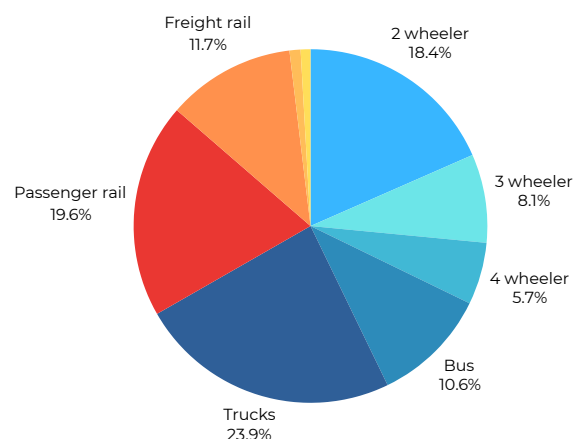
TRANSPORT AND MOBILITY

TRANSPORT RELATED EMISSIONS

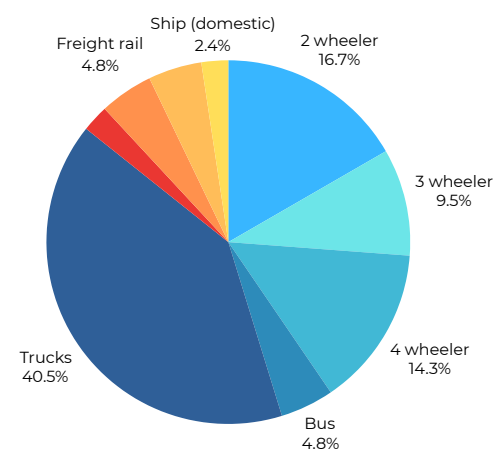
While road transport accounts for ~66 percent of the country's modal share* across passenger and freight transport, its share in transport related emissions is nearly 90 percent. In contrast, despite accounting for over **30 percent of the modal share, rail only accounts for about 6 percent** of transport related emissions.



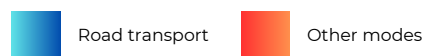
CO2 Emissions (Mt CO2)



Modal Share (billion passenger kilometres / billion tonne kilometers for freight transport)



Energy Demand (ExaJoules)



Source: IIMA Ventures' analysis on data from IEA and CEEW.

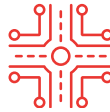
India's strategy for decarbonization of transport sector cannot be anchored simply on electrification of road mobility, there is a need to pay attention on diversifying the modal share in both passenger and freight transport in the country so as to reduce the extreme dependency on road transport to begin with.

* Modal share is the percentage of travelers using a specific type of transportation, or the number of trips taken using that mode of transportation

HOW INDIA TRAVELS



Road transport accounts for 90 percent of passenger and 70 percent of freight movement in India. It also contributes by up to **90 percent of transport related CO2 emissions**.



India has one of the largest road networks in the world extending over **6.3 Mn kilometres**.



Road transport is the largest oil consuming sector accounting for **44 percent** of total consumption in 2021.

PASSENGER TRANSPORT



- Two-wheelers constitute 75 percent of all registered vehicles
- 50 percent households own a motorised two-wheeler



- 3 wheelers constitute <3 percent share in total registered vehicles
- Comparatively higher distance driven than other modes; widespread transition from petrol to CNG and now electrification



- 7x growth in 2 decades from 6 Mn (2000) to 42 Mn (2021); this rate of growth is expected to increase in the future
- Increased uptake of fuel inefficient SUVs (from 17 percent in 2015 to 31 percent in 2019) and slower electrification of personal 4 wheelers

PUBLIC TRANSPORT



- Accounts for about 30 percent of trips taken in urban areas; Mumbai, Kolkata see a higher usage of public transport.
- Urban population increasing ~2.3 percent per year putting pressure on ramping up public transport.
- India's current stock of buses is inadequate. India has ~ 24 buses vs global average of 40-60 buses per 100,000 people.
- Over 90 percent of current fleets are owned and operated by private operators.

FREIGHT TRANSPORT



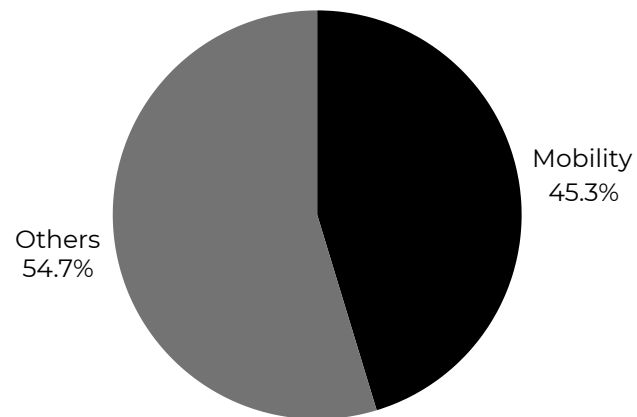
- In 2021, trucks accounted for 38 percent of fuel consumption and CO2 emissions from road transport.
- Trucks account for over 80 percent of road freight transport.
- The industry is highly fragmented, making it difficult to monitor and regulate
 - ~75 percent run by small owner-operators who own less than 5 trucks
 - Only 10 percent market run by fleet operators who own more than 20 trucks
- Thin charging infra and range anxiety impeding electrification of long distance freight transport.

Source: IIMA Ventures' analysis on data from IEA and CEEW.

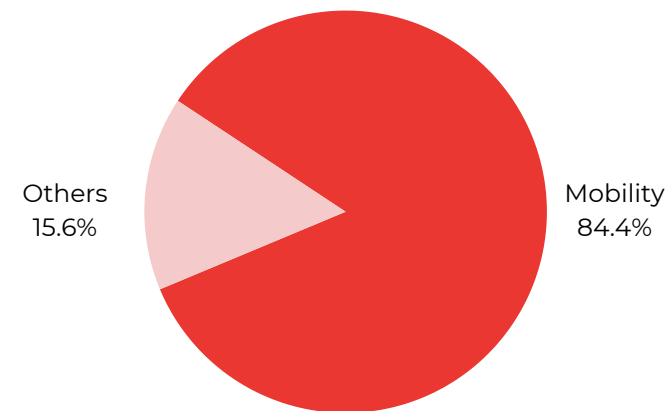
2 and 3 wheelers represent 80 percent of vehicle stock in the country but account for only 20 percent of energy demand and emissions from transport sector.

MOBILITY STARTUP LANDSCAPE

Almost half of India's climate tech startups are building for the mobility, largely personal mobility, value chain. **Every fourth mobility startup has raised funding**, adding up to over **\$3.1 Bn which is almost 85 percent of all the capital invested** into climate tech in India in the last 10 years.



Share of mobility startups in total climate tech startups



~85% of the total funding in the sector raised by mobility startups

Initiatives such as FAME (Faster Adoption and Manufacturing of Electric Vehicles) I & II have incentivised both manufacturers and consumers thus creating a **conductive ecosystem for startups across the EV value chain**. This has allowed for not just new innovations to come up but also for extension of older vehicles as companies developed retrofitting options.

OLA

ATHER

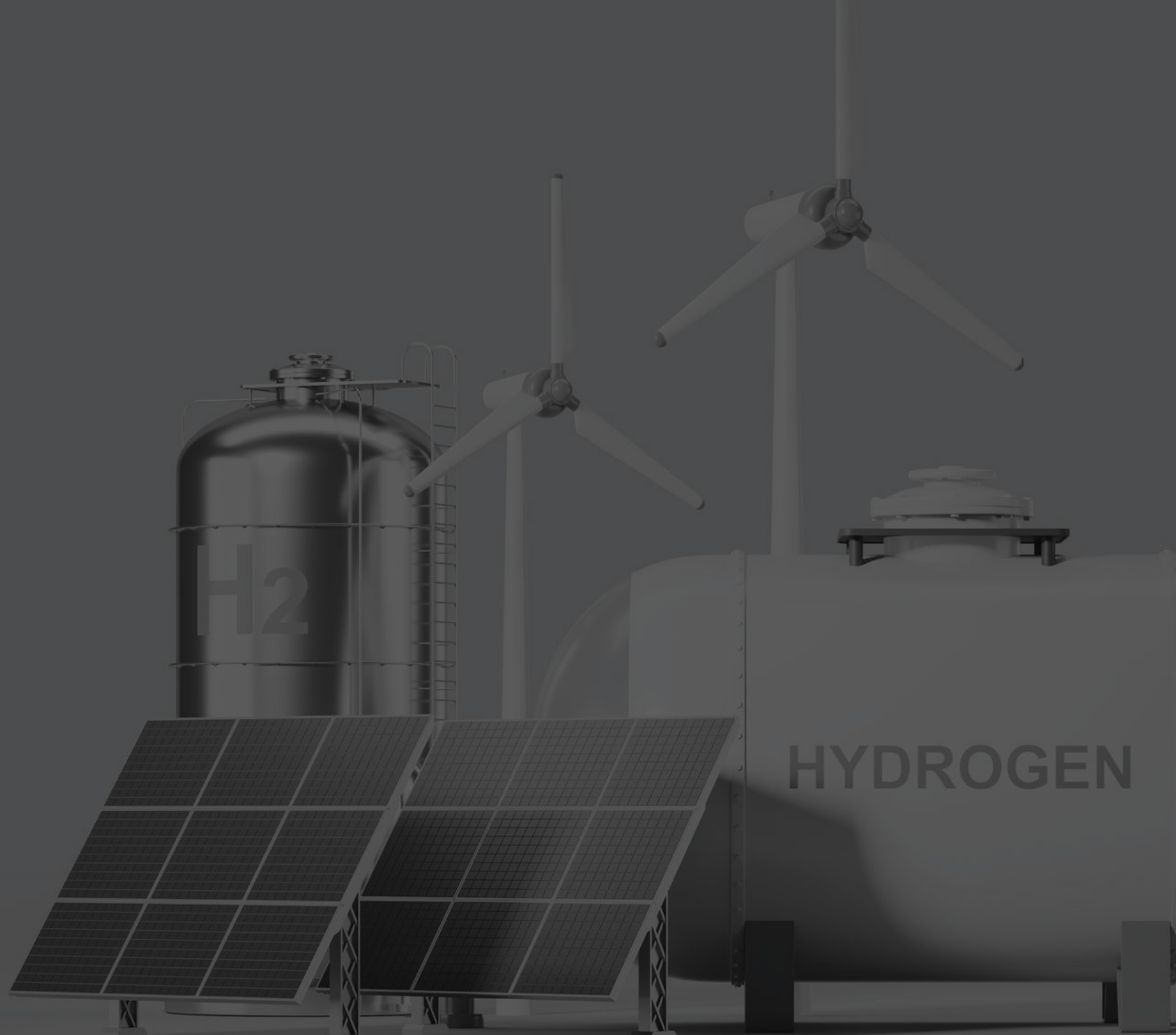
cygni

PURE
ELECTRIC VEHICLE

ULTRAVIOLETTE

exponent

EVAGE
MOTORS





EMERGING SOLUTIONS

ROLE OF RAIL AND AVIATION IN DECARBONIZATION OF MOBILITY

Despite being the greenest mode, with 95 percent electrification achieved on broad gauge network, the share of rail in passenger mobility is expected to decline by 17 percent between 2020 and 2050.

Aviation is a highly energy-intensive mode of transport. The modal share of air travel in domestic passenger transport is expected to grow by 10x by 2050. India has made progress in indigenously producing **Sustainable Aviation Fuel (SAF)** and 2023 marked the success of first domestic commercial passenger flight with SAF.

ELECTRIC MOBILITY STILL HAS UNCAPPED OPPORTUNITIES

Most of the private sector action on transport electrification has been **focused on personal passenger mobility** for both 2 and 4 wheelers. The 2 wheeler uptake has also been boosted by government interventions like the FAME Scheme.

In an otherwise populated space innovations towards **battery energy storage systems (BESS)** and enhancing **efficiency of charging infrastructure** still remain untapped opportunities that is slowing down the consumers' uptake.

TECHNOLOGY UPGRADATION TOWARDS ALTERNATIVE FUELS

Another significant push towards decarbonisation of transport as a sector has been on increasing the share of blended fuels and adopting alternative fuels.

Hydrogen as a fuel has been garnering increasing attention in recent years. Between 2020 and 2050, the cumulative market size for fuel cells alone is anticipated to be USD 40 - 55 Bn, for hydrogen vehicles startups have predominantly been working on generation of green hydrogen but this hasn't scaled mainly because of the **few downstream use cases and an evolving value chain**.

STARTUP CASE STUDIES - **TRANSPORT & MOBILITY**

Electric Mobility



Founded in 2018, **Euler Motors** is an original equipment manufacturer for commercial cargo and passenger EVs in India. Their offerings include liquid-cooled battery; charging infrastructure: >300 charging stations across Delhi & Bangalore; First cargo 3W EV to offer DC fast charging and on-road service – Charge on Wheels; Preventive Services etc.

Euler has raised a total funding of USD 106 Mn from British International Investment, Green Frontier Capital, Athera, Blume, and Alteria Capital, among other corporate and angel investors.

Alternative Fuel



Founded in 2022, **Hygenco** is the developer of ammonia-based hydrogen fuel solutions. It develops and deploys commercial green hydrogen and ammonia production systems. Apart from personal mobility, its applications are used in large-scale process industries, terrestrial and marine transport. Hygenco has raised over USD 25 Mn from Neev Fund.

Emission Mitigation



Founded in 2019, **PI Green Innovations** is a technology company committed to creating sustainable solutions for a greener future.

Its filterless, retrofit, fully automatic and compact device, 'Carbon Cutter', integrates seamlessly with any kind of vehicle, and captures over 90 percent of the particulate matter emitted from vehicles in real-time, ranging from PM2.5 to PM10.

The startup has raised a total funding of USD 5 Mn from Opus Consulting Solutions, JCSS, among other angel investors.



STARTUP CASE STUDIES - **TRANSPORT & MOBILITY**



BOLT.EARTH



ePlane.ai



Batt+RE

Battery Tech

Founded in 2015, **Log9** is one of the pioneers of EV battery technology in the country. The company offers batteries that claim to be charged 9x faster, last 9x longer, and offer 9x higher performance and safety.

LOG9 has raised a total funding of USD 90 Mn from SiriusOne, Cornerstone Venture Partners, Anicut Capital, RTBI, SAB Holding, Trifecta Capital, and Catamaran, among other investors.

It has also received multiple accolades such as The Economic Times Startup Awards 2021, Technology Innovation of the Year award (Electric Vehicle category) at the 6th India Energy Storage Alliance (IESA) Industry Excellence Awards, 2023, National Startup Award 2022 presented by Startup India in the Clean Energy category, and more.



INDUSTRY AND INDUSTRIAL DE- CARBONISATION

GROWTH OF INDUSTRIAL OUTPUT

India's GVA growth of 7.2 percent in FY24 was driven by the 9.9 percent and 7.1 percent growth in manufacturing and mining sectors. The table below captures the projected growth in Industrial output.

Industry	Industrial Output		% increase in production between 2015 and 2050
	2015 (Mn tonne)	2050 (Mn tonne, estimated)	
Steel	95.5	457.6	379.16%
Cement	283.5	1127.7	297.78%
Aluminium	2.4	13	441.67%
Plastics	14	79	464.29%
Ammonia	13.5	19.6	45.19%
Paper	14.9	132.7	790.60%
Glass	4.7	38.5	719.15%
Copper	0.8	14.6	1725.00%
Caustic Soda	2.5	5.9	136.00%
Soda Ash	2.6	10.2	292.31%

Industrial output is expected to grow 3x between 2015 and 2050. This will lead to commensurate increase in CO₂e emissions.

Source: Stephane de la Rue du Can et al. (2019), Applied Energy

DRIVERS OF INDUSTRIAL GROWTH

Existing industries and their projected growth coupled with establishment of new industries will contribute towards an expanding sector of the Indian economy. Policy push towards increasing the share of industries in India's economy will also play a role in boosting the sector.

CASE STUDY - AUTOMOBILE INDUSTRY

India was the third largest automotive industry in the Asia-Pacific region in 2021. The Indian automobile industry is estimated to be USD 126.67 Bn in 2024 and expected to grow at a CAGR of 8.20 percent to reach USD 187.85 Bn by 2029.

Government of India's Automotive Mission Plan 2016-26 has set a target of 12 percent contribution for automobile sector to India's GDP. At present the sector contributes about 7.1 percent of the GDP. Apart from domestic car manufacturers, some international industry leaders with manufacturing facilities in India are:



CASE STUDY - SEMICONDUCTOR MANUFACTURING

India's semiconductor manufacturing industry is poised for significant growth, with several new fabrication plants and assembly units recently approved and under construction.

Current semiconductor manufacturing leaders: Taiwan, China, the United States, South Korea, and Japan. Four semiconductor manufacturing facilities setup in India with investment outlays:

- Micron - Gujarat - USD 825 Mn
- Tata Electronics Private Limited (TEPL) collaboration with Powerchip Semiconductor Manufacturing Corp (PSMC), Taiwan - Gujarat - USD 109 Bn
- Tata Semiconductor Assembly and Test Pvt Ltd (TSAT) - Assam - USD 325 Mn
- CG Power collaboration with Renesas Electronics Corporation, Japan, and Stars Microelectronics, Thailand - Gujarat - USD 91 Mn

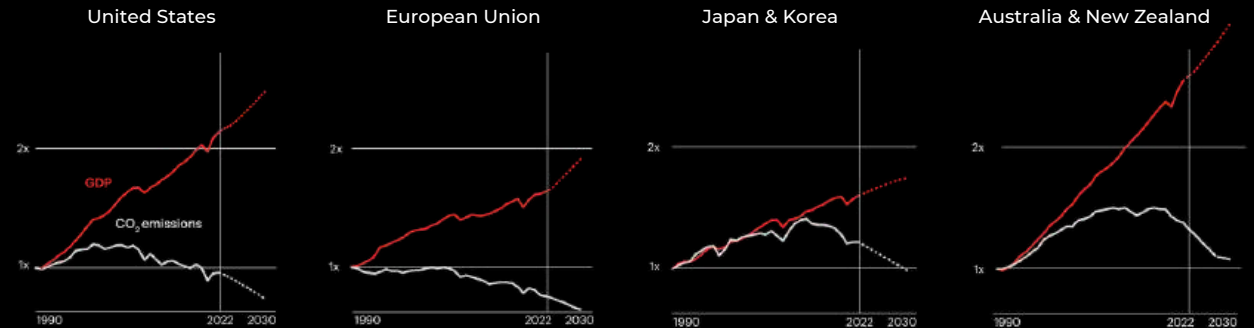
DECOUPLING INDUSTRIAL GROWTH FROM EMISSIONS

Economic growth & greenhouse gas (GHG) emissions are closely linked, as a result of increased industrial activity fuelled by fossil-fuels.

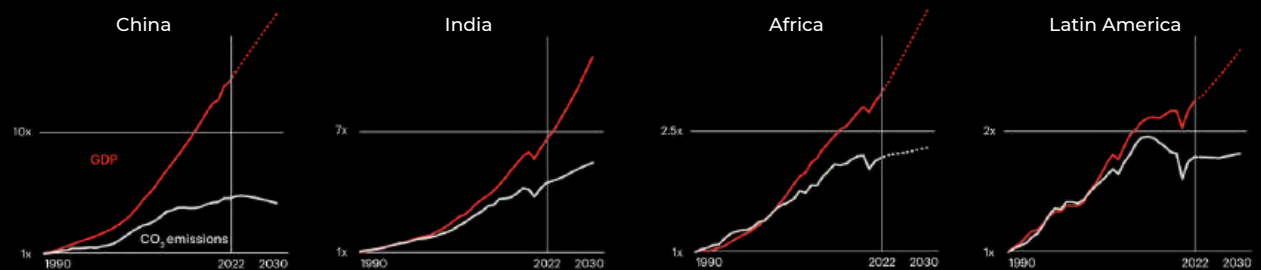
In advanced countries, growth coupled CO₂ emissions peaked around 2007 and have been on a decline since.

In many emerging economies and developing countries, there are recent signs of GDP growth and emissions trajectories diverging largely as a result of clean energy investments and transitioning away from coal.

Regions where emissions are falling while GDP continues to grow.



Regions where emissions and GDP growth are diverging..



Source: International Energy Agency, 2023



HARD-TO-ABATE SECTORS

Emissions from hard-to-abate sectors are expected to rise by 2.6x between 2020 and 2050.

Iron and Steel and Cement industries **represent over 60 percent of emissions** from industrial processes. Any reduction in emissions from efficient use of energy in these sectors is likely be **nullified by future industrial growth**.

A way to tackle could be **energy symbiosis** in industrial parks and collectives. Energy symbiosis entails that industrial units within a cluster share resources like steam, compressed air, and waste heat, and may also collaborate on centralized assets such as a renewable energy microgrid.*

In 2015-16, about **1000 companies** in Ulsan Mipo and Onsan Industrial Park, South Korea **reduced emissions by 665,712 tonnes** through energy symbiosis.

There were about **250 energy symbiosis networks across the world in 2018, but hardly any in India**. This could be a promising strategy for effective decarbonisation of hard-to-abate industries in India. This model may also create **opportunities for climate tech startups** to service industrial clusters as against individual companies.

**Additionally, high-temperature waste heat from processes like refractories and die casting can fulfill or supplement the heat needs both within and beyond the sector, spanning low- and medium-temperature processes. Procuring steam from such a network tends to be more economical compared to producing it onsite. Repurposing residual energy also reduces reliance on primary energy sources for production, enhancing overall efficiency and lowering operational and installation expenses by decreasing energy and fuel purchases, generating revenue from energy exchanges, and sharing investment costs among participants.*

EMERGING SOLUTIONS

INDUSTRIAL DECARBONIZATION

Industry is one of the biggest and rapidly growing source of emissions in India. Uptake for tracking the carbon footprint and decarbonization is **driven by sustainability/ESG mandates** or global client requirements. Decarbonization can be achieved in two ways - **Carbon Capture, Utilisation and Storage (CCUS)** and **carbon offsetting** through trading of carbon credits. There is ample startup activity in both. CCUS deals with capturing carbon emissions at source, processing it and potentially converting it into a usable form (printing ink, graphene etc) or storing it about a kilometre deep underground where it would be stable for hundreds of years. Carbon offsetting is done by trading of carbon credits. These credits are typically generated through creation of carbon sinks via reforestation or agro-forestation. Credits require verification by an authorised agency, which is catalysing **Digital Monitoring, Reporting, and Verification (dMRV) solutions**. Startups here are offering a variety of solutions including tracking and traceability as well as end-to-end management of decarbonization projects.

INCREASING INDUSTRIAL ENERGY EFFICIENCY

The energy efficiency narrative in industries is not only aimed at corporate sustainability agenda but also to enhance profitability in an increasingly competitive landscape.

Evidence of greenification can be seen both in **energy use and choice of fuel**, apart from certain hard to abate industries which continue to be dependent on fossil fuels. There are only about 50 startups building solutions for this use case and products largely include continuous monitoring and adjustments and upgrading/transitioning industry equipment to more efficient ones.

ALTERNATIVE MATERIALS AND RESOURCE PLANNING

The focus on alternative materials in industry is localised in two specific segments: **construction and consumer products**. In the construction sector, alternative materials are deployed to reduce the embedded emissions occurring from the use of cement (emissions in the cement sector are hard-to-abate). Innovations such as carbon negative construction materials, nanomaterial based concrete admixtures are aimed at decarbonizing construction.

Within consumer goods, the focus is towards reducing and replacing single use plastic products with sustainable materials such as bamboo, seaweed fibre, coconut fibre, etc.



More than 75 startups
largely building solutions for
decarbonisation and carbon
trading, energy efficiency,
and alternative materials;
Every second startup
has raised funding, albeit
largely at early stages.

STARTUP CASE STUDIES - **INDUSTRY AND INDUSTRIAL DECARBONISATION**



Industrial Energy Efficiency

Founded in 2014, **Promethean Energy** builds unique waste heat recovery solutions for industrial and commercial applications.

With industries and commercial units having 50 percent of the total input energy released as waste energy, their solutions reduce operational costs and carbon footprint through heat recovery and thermal energy solutions.

The startup has raised a total funding of USD 488 K from Sangam Ventures.



Alternative Materials & Resource Planning

Founded in 2019, **GreenJams** is a cleantech enterprise that creates industry-leading carbon-negative building materials, such as Agrocure - a patented material that offers extraordinary strength and insulation and it does so while cutting down construction times, and construction cost.

The startup has raised a total funding of USD ~370 K from InsightEdge.

Reported impact: 350 percent higher thermal insulation, 60 percent lesser mortar required, and 50 percent lower construction cost.



Industrial Decarbonization

Founded in 2018, **LivNSense** has been working on deep decarbonization. It has built inroads into the manufacturing sector with the vision of creating the sustainable factories through its flagship platform, GreenOps.

The startup has raised USD 3.25 Mn from VNB Holdings, IIMA Ventures, Pavestone Capital, and some angel investors.

Reported impact: 50+ plants globally, 60 TB+ emissions data, and 55 K real-time green data tags.



GRAVIKY LABS



STARTUP CASE STUDIES - **INDUSTRY AND INDUSTRIAL DECARBONISATION**

The logo for carbon trail, featuring the word "carbon" in black and "trail" in a lighter blue, with a small green leaf icon above the "n" in "carbon".The logo for alt carbon, with "alt" in white and "carbon" in black, both in a sans-serif font, set against a black rectangular background.The logo for sentra.world, with "sentra" in grey and ".world" in green, where the "o" in "world" is a green globe icon.The logo for TRIGen Decarbonisation, featuring a green circular icon with two arrows forming a loop, followed by the text "TRIGen Decarbonisation" and "Accelerating Net Zero" below it.The logo for vanna, with the word "vanna" in a green, rounded, lowercase font.

Resource Planning

Founded in 2019, **SD+** makes designing a sustainable building a smooth experience by presenting real estate developers with all the financial & environmental data required to make an informed decision. The platform auto generates sustainable solutions tailored to a project's needs & seamlessly integrates them into the building design.

The startup has raised a total funding of USD 619K from Rainmatter, Gruhas, Anthill Ventures, among other investors.



Industrial Decarbonization

Founded in 2022, **Accacia** is an AI-enabled platform to help real estate and infrastructure companies (developers, asset managers, financial institutions, operators, and governments) meet their net-zero goals. It measures Scope 1, 2 & 3 emissions from asset operations.

The startup has raised a total funding of USD 9 Mn from Illuminate Financial, AC Ventures, Accel, B Capital, Blume Ventures, Rainmatter, among other investors.

Reported impact: Saves ~40 percent in operating cost by decreasing consumption, reduces 100+ man hours a month with automation.

The logo for accacia, with a green leaf icon followed by the word "accacia" in blue.

Industrial Decarbonization

Founded in 2022, **Neufin** empowers financial institutions, traders, corporations and businesses to efficiently discover and execute deals for green project financing, carbon offsets, I-RECs and green PPAs. The startup claims to cover several sectors including solar, waste to energy, carbon removal through NbS, Biochar, CCUS and Electric vehicles.







The startup has raised USD ~970K from Better Capital, Good Capital, Time Zero Capital, Stargazer Growth, among other investors.

The logo for Neufin, with a green icon of three vertical bars of increasing height followed by the word "Neufin" in blue.



WASTE MANAGEMENT AND CIRCULARITY

WASTE & WASTE MANAGEMENT IN INDIA

	<p>Generation: 72368 MLD*</p> <p>Treatment capacity: 36668 MLD</p> <p>Sewage treatment plant: 1631</p>
	<p>Generated: 100 - 150 tpa'</p> <p>Recycling capacity: 1 percent</p>
	<p>Generated: 3.47 million tpa</p> <p>Recycling capacity: 1.56 million tpa</p> <p>Co-processing" capacity: 0.17 million tpa</p>
	<p>Generated: 1.01 million tonnes</p> <p>Recycling/processing capacity: 1.06 million tonnes</p>
	<p>Generated: 8.87 million tonne</p> <p>Recycled/utilised: 5.26 million tonnes</p> <p>Disposed: 3.23 million tonne</p>
	<p>Generated: 1.50 million tpd^</p> <p>Collected: 1.46 million tpd (96.8%)</p> <p>Treated: 70,973 tpd (47%)</p> <p>Landfilled: 40,863 tpd (27.08%)</p>

* million litre per day / megalitre per day
 ' tonnes per annum
 ^ tonnes per day

India has 1.3 Bn tonnes of legacy waste contained in over 3000 waste mountains. This landfill waste accounts for 15 percent of national methane emissions.

Source: Central Pollution Control Board (2020)

*Co-processing refers to use of plastic waste in industrial processes (predominantly cement production) to promote circularity





**About 110 startups building solutions for waste
management and circular economy;
1 in 4 startups (27 startups) raised funding;
over USD 100 Mn raised**



EMERGING SOLUTIONS

INCREASING TRACEABILITY AND TRANSPARENCY IN INDUSTRIAL WASTE VALUE CHAIN

Many startups are working towards **digitization of the waste value chain** - collection, transportation, segregation, processing. Technologies such as computer vision, robotics are also aiding in making waste processing more efficient.

While some startups deliver waste type agnostic products others focus on specific types of waste. There is an increasing number of software solutions and consulting models that enable companies to manage their **Extended Producer Responsibility (EPR)** aimed at better overall management of waste disposal.

WASTE TO VALUE, INCREASING ADOPTION OF CIRCULAR ECONOMY

Recycling, recycled materials and waste-to-energy (W2E) are primary solutions representing the circular economy startup ecosystem in India.

Biotechnology and material science are the technologies driving this movement. There are also examples of design innovations such as Indic Initiatives who have a proprietary machinery design for paper recycling and turning agri waste into paper.

IMPROVING WATER AVAILABILITY AND QUALITY

Around 600 Mn people in India, more than 40 percent of the population, experience high to extreme water stress. **Sectoral water demands** - specifically from agriculture, households, energy generation and industry - **continue to increase**. Central Pollution Control Board (CPCB) estimates that wastewater of only 28 percent of the 72,368 Mn Litres per Day (MLD) of sewage generated in the urban centres is treated. The remaining 72 percent reaches rivers/lakes/groundwater as discharge. To tackle the issues of wastewater and water security, startups are building interesting and innovative solutions in some key areas. These include water management solutions to make usage more efficient and reduce water waste, technology enabled traditional solutions such as air-to-water and rainwater harvesting, and **advanced material and nanomaterials** based purification technologies. A big barrier in the growth prospects of these startups is that water is provided by the state and there are **no validated (at scale) revenue models**.

STARTUP CASE STUDIES - WASTE MANAGEMENT AND CIRCULARITY



Waste Management

Founded in 2015, **Recykal** is a first-of-its-kind technology-driven solution provider for the waste management ecosystem and forms a key link between producers, waste generators, facilitators, and the different stakeholders in the waste management industry in India.

The startup has raised a total funding of USD ~50 Mn from 360 One, Morgan Stanley, Circulate Capital, Triton, Bank of Singapore, Idea Entity, and Avia International, among other angel investors

Reported impact: Connected to 1050 service providers and aggregators, 190 urban local bodies, 210 brands, 325 recyclers and co-processors, 400,000 mt material channelised.

Circular Economy



Founded in 2023, **ElementRe Technologies** offers end-to-end lithium-ion battery recycling solutions. It provides recycling solutions for the EV ecosystem, ensuring the collection of used batteries. It then repurposes the old batteries for secondary applications, such as energy storage, backup power and microgrids.

The company safely recycles the EOL batteries to produce battery-grade cathode materials, such as lithium, cobalt, nickel and manganese, that can be reused for making new batteries.

The startup has raised a total funding of USD ~2 Mn from Stellaris Venture Partners, The Rise Fund, OTP Venture Partners, Accel, AngelList, Apex Group, and Indus Capital Partners.

Water-as-a-Resource



Founded in 2016, **Faclon Labs** is an end-to-end IoT and data analytics company that leverages sensor data to drive operational excellence, cost reduction, digital transformation, process automation & visibility. One of their products is a comprehensive solution for managing water consumption, distribution, quality, maintenance schedules, and periodic diagnostics for industries.

The startup has raised a total funding of USD ~2.8 Mn from Empower India, Supreme Overseas, LetsVenture, Aar Em Ventures, and Neev Fund among others.

Reported impact: 10 Bn+ data points analysed every day, 1000+ trusted users, 300+ projects completed, and 150+ clients.



STARTUP CASE STUDIES - WASTE MANAGEMENT AND CIRCULARITY



Waste-to-Energy

Founded in 2018, **Greenjoules** specializes in making renewable biofuels, commonly recognized as “Drop-in Fuels”, which are curated entirely from agricultural residue and renewable wastes from agro processing industries.

Their plants have been designed modularly for decentralized production, permitting seamless and inclusive growth.

The startup has raised a total funding of USD ~5.3 Mn from Blue Ashva Capital, Mape Citrus Developers, among other investors.



THE EMERGING CLIMATE TECH STARTUP OPPORTUNITIES

DECARBONISATION

Size of the Problem

India's current emissions stand at a whopping 3095Mt CO₂e, making it the third largest emitter in the world. Emissions are a natural part of a developing nation's growth story. But, there are initial signs of emissions decoupling from the India's economic growth. Given the fragmentation in multiple sectors, evolving policy framework and a China+1 thrust by the Indian government, emission mitigation and decarbonisation will be priority issue for the governments and industry equally.*

As part of its international climate commitments, India aims to capture 750 Mn metric tons CO₂ per year by 2050, which is about 25 percent of India's current emissions, which would require an investment of USD 100 - 150 Bn.

Market Size

The decarbonization market in India is expected to reach USD 10.3 Bn by 2032, growing at a CAGR of 13.3 percent from 2023 to 2032

Policy Support

More than 200 policies focused on decarbonisation of the Indian economy as it works towards achieving the ambitious target of 45 percent reduction in emission intensity (of GDP) as part of the NDCs.

Market Momentum

More than USD 20 Mn invested, with more than 80 percent of it invested in the last 3 years. Sectors like manufacturing, power generation, real estate, transport are primed for extensive decarbonisation.

Indicative Startups



* Coal India Limited also seeks to explore decarbonising its operations



CIRCULARITY AND WASTE TO VALUE

Size of the Problem

Waste is a mammoth problem not just in India but the world, with many industries like fashion and FMCG taking steps to curb and/or manage the waste better. There are, of course, varying rates of recycling depending on the type of waste. In India, a majority of the waste is not segregated and ends up in landfills.

In addition to the industry and government action, increased customer awareness is also seeding consumer centric products and solutions.

Market Size

Waste management potentially a USD 15 Bn industry and includes variety of players including players from the industry, distribution, consumers and governments. There are differences in the value chains of different kinds of waste.

Policy Support

From 2020-21 to 2024-25, Swachh Bharat Mission Grameen Phase II and Urban Phase II both have an estimated outlay of around INR 1.40 lakh crores (USD 16.88 Bn) each. The current Waste to Energy programme has a budget outlay of INR 600 crore (USD 71.9 Mn) in its first phase.

Market Momentum

USD 109 Mn invested in waste and circularity solutions between Jan 2014 - Mar 2024. While waste management was largely services oriented, there is a growing number of startups building technology products for the waste value chain.

Indicative Startups



CLIMATE TRACKING AND REPORTING

Size of the Problem

India suffered an economic loss of \$4.2 billion in 2022 due to extreme weather events and climatic disasters, mostly caused by floods. A shift has also been observed towards more frequent dry spells and more intense wet spells during the summer monsoon season. India's average temperature has increased by around 0.7 degrees Celsius between 1901 and 2018. Fine particulate matter (PM2.5) pollution shortens the average Indian's life expectancy by 5.3 years.

Climate data tracking is the first step towards addressing these and many more parameters around causes and impacts of climate change. Various government bodies (national, regional, municipal, etc) are the biggest clients for such solutions.

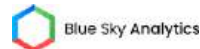
Policy Support

Two - National Mission on Strategic Knowledge for Climate Change and National Mission for Sustaining Himalayan Ecosystems - of the eight national missions emphasise the need for capturing and monitoring climate relevant data in order to create suitable policy measures. Climate vulnerability assessment is also one of the major goals of government established State Climate Change Centres (SCCCs).

Market Momentum

About 20 startups are working directly with different government departments to tackle issues around monitoring air quality, biosphere monitoring and disaster management. Five of these startups have raised cumulative early stage funding of about USD 17.5 Mn.

Indicative Startups



CLIMATE FINANCE

Size of the Problem

Climate finance needs to increase by 590 percent to meet internationally agreed climate objectives by 2030. India has imposed a need for USD 1 Tn in climate finance from developed countries over the next decade. The Paris Agreement reaffirmed the commitment of USD 100 Bn per year from developed nations to developing countries between 2020 and 2025, with a new financing goal by 2025.

Public finance alone, however, is estimated to be insufficient to meet India's mitigation and adaptation targets emphasising the need for private capital to act as a catalyst for climate projects. Recognising this, Union Budget 2024-25 came with the provision to set up a mechanism to stimulate 'private sector-driven research and innovation at commercial scale' for climate action innovations supported by a financing pool of INR 10,000 crore. It also proposed to develop a taxonomy for climate finance, aimed to address the lack of standardisation that has been burdening the ecosystem.

Climate Finance instruments leveraged by Government of India

Sovereign Green Bonds: Issued by Government of India to mobilise resources for public sector projects contributing towards reduction of carbon intensity of the economy. According to the Securities and Exchange Board of India (SEBI), INR 6,128 crore (approx. USD 740 million) has been raised through green bonds in India, as of March, 2024.

Private Capital as Climate Finance

According to a 2015 report by GIZ, around USD 34 Bn has been invested in India to mobilize private climate finance, predominantly in renewable energy, energy efficiency, and transport. NBFCs such as Ecofy are helping channel private capital towards climate action, especially at consumer level.

Climate Tech Investment Trends





Our analysis revealed USD 3.6 Bn+ invested in the climate tech startup ecosystem between Jan 2014 - Mar 2024. FinTech startups raised a whopping USD 19.3 Bn during the same period. 2/3rd of the total funded startups (150) have only raised a Seed round. Only 20 startups (9 percent of total funded) raised a growth stage round (Series A+).

Unmet need of growth stage capital for Climate Tech startups

Most private and government sector climate finance is largely available in small ticket sizes that are suitable to early stage companies, at best. There is a visible absence of climate finance options that startups can leverage for scaling up their offerings and achieving growth.



ALTERNATIVE FUELS

	Mobility	Non - Mobility
Size of the Problem	Energy demand within the mobility sector is expected to increase by 50 percent between 2019 and 2050. This is fuelled by the growth in private vehicle ownership.	Energy demand from industries and buildings (residential and commercial) is expected to grow by 50 percent and 20 percent respectively between 2019 and 2050. Increased urbanisation and rising temperatures will push the demand particularly for the urban residential sector.
Market Size	The EV market size is projected to reach USD 637.85 Bn by 2032.	India's green hydrogen electrolyzer market is projected to reach USD 78 Bn by 2050, up from ~USD 4 Bn in 2030. The market for biofuels in India is expected to reach USD 10.31 Bn by 2030, growing at a CAGR of 22% between 2023 and 2030.
Policy Support	National Biofuels Policy, National Green Hydrogen Mission, FAME Phase I & II	National Green Hydrogen Mission
Market Momentum	More than USD 3 Bn invested in startups	USD 20 Mn invested at growth stage (Series A+) despite it being a relatively nascent space
Indicative Startups	  	

With 800+ startups, \$4 bn in funding, 50+ unique technology products across mitigation, adaptation and resilience tria, the Indian climate tech startups are demonstrating their strong foothold in the world.

Technology, innovation and entrepreneurial grit hold promise to respond to both the causes and impact of climate change.

ACKNOWLEDGEMENT

We thank the following entrepreneurs, investors, enablers, stakeholders, and subject matter experts who have shared their insights and opinions on this study.

Anup Jain, ex-Orios

Apoorv Shaligram, eTrnl Energy

Arjun Gupta, Smart Joules

Arpita Kalanuria, Amplepac

Ashish Airon, Cognitensor

Ashwin KP, Promethean Energy

Asim Bhalerao, Fluid Robotics

Bhagyashree Jain, The Disposal Company

Bhaktha Keshavachar, Chara

Jayant Prasad, cKers Finance

Keshav Daga, Invest India

Dr. Kushant Uppal, IndusDC

Lakshmi Santhanam, Renkuba

Maya Chandrasekaran, Green Artha Innovations

Mudit Narain, Blume Ventures

Nikhil Aggarwal, Grip Invest

Nithish Kumar, Speciale Invest

Pulkit Khurana, Battery Smart

Sandiip Bhammer, Green Frontier Capital

Sanjeev Agarwal, Hexa Climate; ex-Amplus

Sanket Sarang, BlobCity

Satya Narayan Sheshadri, The Energy Collective - IIT Madras

Saurav Kumar, Euler Motors

Shantanu Chaturvedi, TransitionVC

Shiva Shanker, Ankur Capital

Shruti Singh, Terra Bioware

Srivatsa Sreenivasarao, TraceX Technologies

Sushma Kaushik, 108 Capital

Tejas Kusurkar, Offgrid Energy Labs

Vishnu Rajeev, Speciale Invest

REFERENCES

Details about the featured startups were retrieved from their websites and official social media handles. Additional references are listed below.

- Anand, S. (2024, January 19). India's power demand projected to reach 366 GW by 2030; capacity expansion to 900 GW targeted. *Economic Times*. Retrieved from <https://energy.economictimes.indiatimes.com/news/power/indias-power-demand-projected-to-reach-366-gw-by-2030-capacity-expansion-to-900-gw-targeted/106971394>
- Bhardwaj, N. (2024, May 31). How climate change can impact GDP and jobs. *Forbes India*. <https://www.forbesindia.com/article/take-one-big-story-of-the-day/how-climate-change-can-impact-gdp-and-jobs/87673/1>
- Central Pollution Control Board (CPCB). (2021). Annual Report 2020-21 [PDF]. Retrieved from <https://cpcb.nic.in/annual-report/>
- Chaudhary, M. (2024, February 27). India's thirst for improved water security. *East Asia Forum*. <https://eastasiaforum.org/2024/02/27/indias-thirst-for-improved-water-security/>
- Social Alpha. (n.d.). Clean Energy International Incubation Centre (CEIIC). Social Alpha. Retrieved from <https://ceiic.socialalpha.org/>
- Frontline. (2023, October 6). Climate crisis: India saw extreme weather events almost every day from Jan to Sep 2023: Report. *Frontline*. Retrieved from <https://frontline.thehindu.com/news/climate-crisis-india-saw-extreme-weather-events-almost-every-day-from-jan-to-sep-2023-report/article67590713.ece>
- Coal India Limited. (n.d.). About. Retrieved from <https://www.linkedin.com/company/coalindialtd/about/>
- Coherent Market Insights. (n.d.). India biofuels market. Retrieved from <https://www.coherentmi.com/industry-reports/india-biofuels-market>
- Council on Energy, Environment and Water. (2021). Preparing India for extreme climate change events and weather conditions. Retrieved May 31, 2024, from <https://www.ceew.in/publications/preparing-india-for-extreme-climate-change-events-and-weather-conditions>
- Deb, K., & Roy, N. (2023, December 1). Assessing India's Progress Against Climate Goals. Columbia University, Center on Global Energy Policy. Retrieved from <https://www.energypolicy.columbia.edu/cop28-assessing-indias-progress-against-climate-goals/>
- Department of Animal Husbandry and Dairying (DAHD). (2019). 20th Livestock Census. Retrieved from <https://dahd.nic.in/sites/default/files/Key%20Results%2BAnnexure%2018.10.2019.pdf>
- Department of Science & Technology, Government of India. (n.d.). Climate Change Programme. Retrieved from <https://dst.gov.in/climate-change-programme#:~:text=Currently%205%20SCCs%20viz%3B%20Himachal,the%20stakeholders%20by%20the%20SCCs>
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). (2015, April). The Role of the Private Sector to Scale Up Climate Finance in India [PDF]. Retrieved from https://smartnet.niua.org/sites/default/files/resources/giz2015-en-nama-india-private-financial-institutions-climate-finance-final-report_0.pdf
- Dhar, P. K. (2023, August 17). Can lab-grown meat satisfy India's growing food needs? *NDTV*. Retrieved from <https://www.ndtv.com/opinion/can-lab-grown-meat-satisfy-indias-growing-food-needs-4305348>
- Ease of Doing Business. (2024, May 22). Plan in place to make India biggest auto manufacturing hub in 5 years. Retrieved from <https://eodb.news/plan-in-place-to-make-india-biggest-auto-manufacturing-hub-in-5-years/>

REFERENCES

- Economic Times. (2011, April 10). *Coal India gets Maharatna tag*. Retrieved from <https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/coal-india-gets-maharatna-tag/articleshow/7943638.cms?from=mdr>
- Economic Times. (2022, February 15). *400,000 coal staff, mostly in India, China, to lose jobs as world shuns the dirty fuel*. Retrieved from <https://economictimes.indiatimes.com/industry/energy/power/400000-coal-staff-mostly-in-india-china-to-lose-jobs-as-world-shuns-the-dirty-fuel/articleshow/104335910.cms>
- Economic Times. (2023, June 22). *India can have a \$78 billion green hydrogen electrolyzer market by 2050: Report*. Retrieved from <https://economictimes.indiatimes.com/industry/renewables/india-can-have-a-78-billion-green-hydrogen-electrolyzer-market-by-2050-report/articleshow/109248489.cms>
- Economic Times. (2024, March 21). *With Rs 6,500 cr dedicated budget in 2024-25, railway can achieve 100% electrification: Officials*. Retrieved from <https://economictimes.indiatimes.com/industry/transportation/railways/with-rs-6500-cr-dedicated-budget-in-2024-25-railway-can-achieve-100-electrification-officials/articleshow/109044316.cms>
- Economic Times. (2024, May 31). *India's GDP grows 7.8% in Q4 FY24, growth pegged at 8.2%*. Retrieved from <https://economictimes.indiatimes.com/news/economy/indicators/indias-gdp-grows-7-8-per-cent-in-q4-fy24-growth-pegged-at-8-2-per-cent/articleshow/110595616.cms>
- Energy Policy Institute at the University of Chicago. (n.d.). *Country Spotlight: India. Air Quality Life Index (AQLI)*. Retrieved from <https://aqli.epic.uchicago.edu/country-spotlight/india/>
- Global GHG Emissions Data Platform. (n.d.). *Economy-Wide Data*. Retrieved from <https://www.ghgplatform-india.org/economy-wide/>
- Godde, C. M., Mayberry, D. E., Thornton, P. K., & Herrero, M. *Impacts of climate change on the livestock food supply chain; a review of the evidence*. Global Food Security, 28. <https://doi.org/10.1016/j.gfs.2020.100488>
- Government of India. (2023). *Ministry of Statistics and Programme Implementation. Environment Statistics in India - 2023 (Vol. 1)*. Retrieved from https://www.mospi.gov.in/sites/default/files/reports_and_publication/statistical_publication/EnvStats/Complete_ESI_2023_VolI.pdf
- Gupta, R., Sankhe, S., Unni, N., & Malik, D. (2022). *Decarbonising India: Charting a pathway for sustainable growth*. McKinsey & Company. Retrieved from <https://www.mckinsey.com/~media/mckinsey/business%20functions/sustainability/our%20insights/decarbonizing%20india%20charting%20a%20pathway%20for%20sustainable%20growth/Decarbonising-India-Charting-a-pathway-for-sustainable-growth-ES-Oct-2022.pdf>
- Hussain, F. I., & Dill, H. (2023, June 12). *India incorporates green bonds into its climate finance strategy*. World Bank Blogs. Retrieved from <https://blogs.worldbank.org/en/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy>
- India Environment Portal. (n.d.). *Large businesses; larger emission footprints*. Retrieved from <http://www.indiaenvironmentportal.org.in/media/iep/infographics/global250/index.html#:~:text=Besides%20Coal%20India%2C%20three%20other%20Indian%20companies%20>
- India GHG Program. (n.d.). *Climate finance*. Retrieved from <https://indiaghgp.org/climate-finance/>
- International Energy Agency (IEA). (2021). *India Energy Outlook 2021 [PDF]*. Retrieved from https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf

REFERENCES

- International Energy Agency. (2023). *Transitioning India's Road Transport Sector*. International Energy Agency. <https://iea.blob.core.windows.net/assets/06ad8de6-52c6-4be3-96fc-2bdc3510617d/TransitioningIndiasRoadTransportSector.pdf>
- International Energy Agency. (n.d.). *Policies in India*. Retrieved from <https://www.iea.org/policies?q=indi&country%5B0%5D=India&status=In%20force>
- International Finance Corporation. (2023). *Blended finance for climate investments in India*. Retrieved from <https://www.ifc.org/en/insights-reports/2023/blended-finance-for-climate-investments-in-india>
- Kamboj, P., Malyan, A., Kaur, H., Jain, H., & Chaturvedi, V. (2022, June). *India Transport Energy Outlook*. Council on Energy, Environment and Water (CEEW). Retrieved from <https://www.ceew.in/sites/default/files/ceew-research-transport-energy-use-carbon-emissions-decarbonisation.pdf>
- Krishnan, G. (2022, December 23). *Energy symbiosis for decarbonising India's hard-to-abate sectors*. Economic Times Energy. Retrieved from <https://energy.economictimes.indiatimes.com/news/power/energy-symbiosis-for-decarbonising-indias-hard-to-abate-sectors/96432555>
- Kumar R, Das AJ. (2014). *Climate Change and its Impact on Land Degradation: Imperative Need to Focus*. Journal of Climatology & Weather Forecasting. DOI: 10.4172/2332-2594.1000108. Retrieved from <https://www.iomcworld.com/open-access/climate-change-and-its-impact-on-land-degradation-imperative-need-to-focus-2332-2594.1000108.pdf>
- Kumar, N. (n.d.). *Electricity wastage in homes: A closer look at the startling average percentages*. Bigwit Energy. Retrieved from <https://www.bigwitenergy.com/post/electricity-wastage-in-homes-a-closer-look-at-the-startling-average-percentages>
- Latief, Y. (2024, January 8). *Indian power sector reforms: Increasing power supply and reducing losses*. Smart Energy International. Retrieved from <https://www.smart-energy.com/regional-news/indian-subcontinent/indian-power-sector-reforms-increasing-power-supply-and-reducing-losses/>
- Mahale, S. (2023, July 2). *How India's trash mountains are contributing to climate change*. Moneycontrol. Retrieved from <https://www.moneycontrol.com/news/environment/how-indias-trash-mountains-are-contributing-to-climate-change-10889641.html>
- Ministry of New and Renewable Energy, Government of India. (2022). *Waste to energy [PDF]*. Retrieved from <https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2022/12/2022122763-1.pdf>
- MoEFCC. (2023). *India: Third National Communication and Initial Adaptation Communication to the United Nations Framework Convention on Climate Change*. New Delhi: Ministry of Environment, Forest and Climate Change, Government of India.
- Mohanty, A., & Wadhawan, S. (2021). *Mapping climate change vulnerability index of India: A district-level assessment*. Council on Energy, Environment and Water. <https://www.ceew.in/publications/mapping-climate-change-vulnerability-index-of-india-a-district-level-assessment>
- National Institution for Transforming India (NITI Aayog). (n.d.). *Electricity Generation*. Retrieved from <https://iced.niti.gov.in/energy/electricity/generation>
- NITI Aayog. (2022, August). *Urban Wastewater Scenario in India [PDF]*. Retrieved from https://www.niti.gov.in/sites/default/files/2022-09/Waste-Water-A4_20092022.pdf
- Open Government Data (OGD) Platform India. (n.d.). *Seasonal and annual mean temperature series from 1901 to 2019*. Retrieved from <https://data.gov.in/resource/seasonal-and-annual-mean-temperature-series-1901-2019>
- Pahuja, N., Pruthi, A., Raj, A., Puri, R., & Sastry, M. (n.d.). *Working Paper: Subnational Action in India: A Framework for Accelerated Climate Action*. The Energy and Resources Institute (TERI). Retrieved from <https://www.teriin.org/projects/nfa/files/working-paper-subnational-action.pdf>

REFERENCES

- Periodic Labour Force Survey. (2023). *Employment and Unemployment Situation among Various Religious Communities in Rural Areas*. Retrieved from <https://sansad.in/getFile/loksabhaquestions/annex/1714/AS228.pdf?source=pgals#:~:text=According%20to%20the%20Periodic%20Labour,allied%20sector%20during%202022%2D23>
- Prakash, S., & Mishra, A. (2024). *Role of AI and machine learning in achieving sustainable development goals*. Sustainable Development, 1-10. Retrieved from <https://doi.org/10.1016/j.sd.2024.100006>
- Precedence Research. (n.d.). *India electric vehicle market*. Retrieved from <https://www.precedenceresearch.com/india-electric-vehicle-market>
- Press Information Bureau, Government of India. (2023, May 19). *Sustainable Aviation Fuel (SAF) using indigenous feedstock, Make in India technology is a major step towards self-reliance and de-carbonization of the aviation sector: Hardeep Singh Puri. For India to be energy Atmanirbhar by 2047, Petroleum Sector is the key: Hardeep Singh Puri [Press release]*. Retrieved from <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1925417>
- Press Information Bureau, Government of India. (2023, October 10). *India's energy demand will continue to provide fuel for future economic growth and is bound to grow exponentially in coming years: Petroleum Minister Hardeep S Puri inaugurates 26th Energy Technology Meet*. Retrieved from <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1966227>
- Press Information Bureau. (2021, September 29). *PM to launch Swachh Bharat Mission-Urban 2.0 and AMRUT 2.0 on 1st October [Press release]*. Retrieved from <https://pib.gov.in/PressReleasePage.aspx?PRID=1759593>
- Rao, A. (2024, March 13). *India's semiconductor sector welcomes three new manufacturing units*. India Briefing. Retrieved from <https://www.india-briefing.com/news/indias-semiconductor-sector-welcomes-three-new-manufacturing-units-31434.html/>
- Rath, M. (2022, June 9). *Recycling waste can generate crores in revenue in India*. Times of India. Retrieved from <https://timesofindia.indiatimes.com/blogs/voices/recycling-waste-can-generate-crores-in-revenue-in-india/>
- Ray, K. (2023, December 17). *Weathering the Storm: India grapples with climate change*. Deccan Herald. Retrieved from <https://www.deccanherald.com/india/weathering-the-storm-india-grapples-with-climate-change-2814503>
- Roy Bardhan, A. (2024, March 20). *Leveraging the rice export ban for crop substitution in India*. Observer Research Foundation (ORF). Retrieved from https://www.orfonline.org/research/leveraging-the-rice-export-ban-for-crop-substitution-in-india#_edn14
- Shakti Foundation. (n.d.). *Climate finance*. Retrieved from <https://shaktifoundation.in/climate-finance/>
- Sharma, Y. (2023, August 17). *10 automobile giants with manufacturing facilities in India: Tata Motors to Mercedes-Benz*. Times of India. Retrieved from <https://timesofindia.indiatimes.com/auto/web-stories/10-automobile-giants-with-manufacturing-facilities-in-india-tata-motors-to-mercedes-benz/photostory/102801574.cms?picid=102801666>
- Singh, R. (2023, November 30). *Indian planning body proposes CCUS framework, eyeing 750 mil mt/year CO2 capture by 2050*. S&P Global Commodity Insights. Retrieved from <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/113022-indian-planning-body-proposes-ccus-framework-eyeing-750-mil-mt-year-co2-capture-by-2050>
- Singh, S. (2024, January 31). *The relationship between growth in GDP and CO2 has loosened; it needs to be cut completely*. International Energy Agency (IEA). Retrieved from <https://www.iea.org/commentaries/the-relationship-between-growth-in-gdp-and-co2-has-loosened-it-needs-to-be-cut-completely>
- Srinivasa Rao, Ch., Prasad, R.S. and Mohapatra, T. (2019). *Climate Change and Indian Agriculture: Impacts, Coping Strategies, Programmes and Policy*. Technical Bulletin/Policy Document 2019. Indian Council of Agricultural Research, Ministry of Agriculture and Farmers' Welfare and Ministry of Environment, Forestry and Climate Change, Government of India, New Delhi. p25.

REFERENCES

- Stephane de la Rue du Can, S., Khandekar, A., Abhyankar, N., Phadke, A., Khanna, N. Z., Fridley, D., & Zhou, N. (2019, March 15). *Modeling India's energy future using a bottom-up approach*. Applied Energy, 238, Article 113281. <https://doi.org/10.1016/j.apenergy.2019.113281> . Retrieved from <https://www.sciencedirect.com/science/article/pii/S0306261919300674?via%3DiHub#t0010>
- Sudarshan, A., Somanathan, E., Somanathan, R., & Tewari, M. (2021, March 25). *Climate change may hurt Indian manufacturing due to heat stress on workers*. EPIC-India. <https://epic.uchicago.in/climate-change-may-hurt-indian-manufacturing-due-to-heat-stress-on-workers/>
- Swachh Bharat Mission. (n.d.). *Implementation of PFMS for SBM [PDF]*. Retrieved from https://swachhbharatmission.gov.in/SBMGUPLOAD/writereaddata/Portal/LettersNCircular/13705f9f-d_Implementation_PFMS.pdf
- The Hindu. (2024, January 21). *India's power consumption grows nearly 8% in April-December*. Retrieved from <https://www.thehindu.com/business/Economy/indias-power-consumption-grows-nearly-8-in-april-december/article67761902.ece>
- Times of India. (2023, March 3). *Share of agriculture in India's GDP declined to 15% in FY23: Govt*. Retrieved from <https://timesofindia.indiatimes.com/business/india-business/share-of-agriculture-in-indias-gdp-declined-to-15-in-fy23-govt/articleshow/106122335.cms>
- Tracxn. (n.d.). *Database platform*. Retrieved from <https://platform.tracxn.com/a/dashboard>
- Worldometer. (n.d.). *India Population*. Worldometer. Retrieved from <https://www.worldometers.info/world-population/india-population/>

LIST OF ABBREVIATIONS

°C	Celsius	CO₂	Carbon dioxide	INR	Indian Rupee
AC	Air Conditioner	CO₂e	Carbon dioxide equivalent	IoT	Internet of Things
AI	Artificial Intelligence	DISCOM	Distribution Company	Mn	Million
AT&C	Aggregate Technical & Commercial	DMRV	Digital Monitoring, Reporting, & Verification	Mt CO₂e	Million Tonnes of Carbon Dioxide equivalent
Bn	Billion	EJ	Exajoule	NDC	National Determined Contribution
CAGR	Compound Annual Growth Rate	GDP	Gross Domestic Product	PV	Photovoltaic
CCUS	Carbon Capture, Utilisation and Storage	GHG	Greenhouse Gases	SAPCC	State Action Plan on Climate Change
CNG	Compressed Natural Gas	GW	Gigawatt	SCCC	State Climate Change Centres
Tn	Trillion			USD	United States Dollar

India Climate Tech Startup Landscape

Authors

Shailaja Shukla
Priya Mishra
Supriya Sharma

Contributors

Nandini Singh
Chirag Jasani
Arpita Gupta
Muskaan Agarwal

Supported by

Samvegi Shah
Nikita Kukreja

Copyright ©2024 CIIE Initiatives

All rights reserved.

No part of this report may be reproduced or used in any for without the written permission of the copyright owner except for use of quotations of information or data for publicity purposes as fair use.

MUFG: ESG INVESTMENTS

Year/ Month	Region / Country	MUFG Investment
2024-Jun	Americas / US	LanzaJet (Sustainable Aviation Fuel startup)
2024-Jun	APAC / India	Battery Smart (EV battery startup)
2023-Nov	APAC / Singapore	Project GreenPrint with MAS
2023-Oct	Japan	SDG Impact Fund
2023-Jul	Japan	FRD Japan (sustainable seafood startup)
2023-Jun	Japan	Imprint Nature-Based Opportunities and Manulife Forest Climate Fund
2023-Jun	Global	Decarbonization Partners with Blackrock
2023-May	Japan	Marunouchi Climate Tech Growth Fund
2023-May	Japan	PowerX (power storage and transmission)
2023-Feb	Japan	Zeroboard
2021-Nov	Americas / US	First Element Fuel
2021-Sep	APAC / Singapore	GreenOn with iApps
2021-Sep	Japan	Carbon Neutral Fund 1 Investment Ltd. Partnership (Z Energy Co. Ltd)
2021-Aug	Japan	MPower Partners Fund L.P (MPower KK)

In the area of climate tech, the development of advanced technologies and proliferation of solutions are essential in achieving a carbon neutral society. MUFG has been supporting customers' efforts toward decarbonization and innovative technologies. Through growth investments in climate tech-related startups, MUFG supports commercialization and scaling up for these companies' advanced technologies and the penetration of their technologies into society, enhancing the corporate value of investee companies while providing support for the achievement of a carbon-neutral society.

OUR ESG-THEMED PRODUCT OFFERINGS

“Response to climate change & environmental protection” is one of the most important issues for MUFG’s Sustainability Management. By tackling this issue, MUFG will contribute to creating a sustainable society by fostering a virtuous cycle between the environment and economy.”

- MUFG’s journey to the Carbon Neutrality Declaration

Loan

- Green, Social, Sustainability Loan
- Sustainability-Linked Loan
- Transition Loan

Bond

- Green, Social, Sustainability Bond
- Sustainability-Linked Bond
- Transition Bond

Deposit

- Green Deposit: a Time Deposit which is notionally matched against a Green Loan

ESG Advisory

- Providing thematic and tailored advice, such as ESG ratings, KPI benchmarking
- Establishment of ESG financing framework

Derivatives

- ESG Interest Rate Swap, Cross Currency Swap, Coupon Swap
- ESG Structured Deposit

Trade Finance

- Sustainable Trade Asset Financing
- Sustainability-Linked Trade Financing

Mitsubishi UFJ Financial Group (“MUFG”) includes:

- (i) MUFG Bank, Ltd. (“MUFG Bank”), the banking business responsible for the structuring and execution of loans and
- (ii) relevant MUFG Securities affiliates, the securities business – responsible for the structuring and execution of capital markets products.



Founded in 2002 as an entrepreneurship centre at IIM Ahmedabad, IIMA Ventures (Formerly known as IIMA-CIIE) is the innovation continuum that studies, educates, incubates, accelerates and invests in early stage startups, aspiring entrepreneurs and investors.

IIMA Ventures has mentored over 7000 founders, accelerated over 1500 startups, provided catalytic capital to over 700 companies, and inspired over a million people with our 400+ publications. It has been a pioneer on multiple fronts including India's first accelerator - iAccelerator, India's largest idea scouting competition - The Power of Ideas, India's first climate fund - INFUSE Ventures, India's biggest platform for inclusive fintechs - Bharat Inclusion Initiative, India's first entrepreneurship bestseller - Stay Hungry Stay Foolish, and many more.

IIMA Ventures is recognised as a Centre of Excellence by the Department of Science and Technology, Government of India.

THE INNOVATION CONTINUUM

Regional Incubation

Ability to identify solid teams and companies early, from India's startup hotspots as well as tier-2/3 cities

Venture Capital

Ability to help scale-up best companies across key thematic areas

Acceleration & Seed Investments

Ability to seed best companies in key thematic areas from across the country through catalytic capital and hands-on support

Insights

Ability to identify technology trends through sectoral research and deliver impactful, action oriented coaching



INFUSE (Indian Fund for Sustainable Energy) Ventures was an early-stage venture fund focused on sustainability and clean tech. Launched in 2011 with support from India's Ministry of New and Renewable Energy, INFUSE aimed to build and scale high-growth businesses in the clean tech sector. The fund provided catalytic capital, funding, and mentoring to startups in renewable energy, leveraging expertise from global energy entrepreneurs, investors, policymakers, and researchers. INFUSE concentrated on commercializing indigenous, market-ready solutions through innovative business models in areas such as renewable energy generation, energy efficiency, storage, and green buildings. Throughout its tenure, INFUSE empowered entrepreneurs, accelerated clean energy technology development, and contributed to India's energy security and environmental sustainability goals.

CLIMATE TECH: SELECT COMPANIES FROM IIMA VENTURES PORTFOLIO



Environmental Analytics platform for accurate monitoring & insights



SaaS platform to map ESG lifecycle management)



Integrated MLOps platform for energy management)



Intelligent platform for process optimization in industries



Novel Cell design company disrupting future of energy storage and consumption



Rare Earth Free Motors for electron based economy



AI Cloud driven energy management solutions



TheDisposal.Co

Plastic credit platform to offset plastic consumption



AI & Blockchain platform to facilitate package return and reuse)



Cell Propulsion

Power train platform for new age EV commercial vehicles



Agri input player making novel Integrated pest management products (based on pheromone)



Manufactures natural, 100% biodegradable, non-toxic biosurfactants that can reduce the use of harsh chemicals in various industrial applications



India's largest clean cookstoves company, developing high-performance & affordable cookstoves



next-gen energy storage solutions by repurposing used lithium-ion battery packs



Developing prismatic glass design to increase the solar panel efficiency

Indicative list. This is not a comprehensive list of our portfolio



Contact us:

+91-79-71524201

insights@iimaventures.com

IIMA Ventures, IIMA New Campus,
Ahmedabad - 380015

Follow us:

@IIMAVentures

