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Climate and Sustainability Initiative

ACCESSING INSTITUTIONAL CAPITAL FOR INDIA'S GREEN TRANSITION

Shubhansh Garg, CFA
Labanya Prakash Jena, CFA

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- Green Assets
- Institutional Capital
- Policy & Regulation
- Capital Market
- Alternative Assets

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Author: CA Shubhansh Garg, CFA, Senior Analyst, CSI
Labanya Prakash Jena, CFA, Director, CSI

External Reviewers: Chirag Mehta, Chief Investment Officer, Quantum AMC; Ammar Suratwala, Associate Portfolio Manager, Quantum AMC; Saibal Ghosh, Chief Investment Officer, Bandhan Life; Priyanka Dhingra, Chief Manager - ESG Research, SBI MF

Peer reviewer: Vaibhav Pratap Singh, Executive Director, Climate and Sustainability Initiative (CSI)
Gaurav Yadav, Primary Market Relationship (Equity and Debt), Sustainability, Product Strategy and Development, National Stock Exchange of India Ltd. (NSE)

Publication team: Junisha Kaul, Media & Comms Specialist, Climate and Sustainability Initiative (CSI); The Clean Copy & HAC Morph Studios

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Foreword

India's journey towards Viksit Bharat and Net Zero by 2070 will require one of the largest capital mobilisation efforts in the nation's history. Achieving this transition will demand sustained investments across renewable energy, clean mobility, green hydrogen, industrial decarbonisation, resilient infrastructure, and emerging climate technologies. While public finance and bank lending will continue to play an important role, the scale of the opportunity requires significantly greater participation from institutional investors.

With assets under management running into trillions of rupees and investment horizons aligned with long-term infrastructure and transition assets, pension funds, insurance companies, mutual funds and other institutional investors are uniquely positioned to become key enablers of India's green transition. Unlocking this capital will require a combination of credible investment opportunities, innovative financing structures, robust risk-mitigation mechanisms and a supportive regulatory ecosystem.
This report, Accessing Institutional Capital for Green Transition, provides a timely assessment of how India's institutional investment ecosystem can contribute to addressing the climate finance gap. It highlights pathways for scaling investments through public equity, debt markets and alternative investment structures, while identifying policy and market interventions necessary to attract long-term capital towards sustainable sectors.

As India's leading exchange, NSE remains committed to strengthening capital markets that facilitate efficient capital formation, innovation and sustainable economic growth. Deep, transparent and resilient capital markets will be instrumental in connecting long-term investors with the financing needs of India's green economy and supporting the country's transition towards a more sustainable and competitive future.

I congratulate the authors and contributors for their valuable insights and recommendations. I am confident that this report will serve as a useful resource for policymakers, regulators, investors and market participants working together to accelerate India's climate finance journey.

Ashishkumar Chauhan
Managing Director & CEO
National Stock Exchange of India Limited

Abbreviations

ABS	Asset-Backed Securities
AIF	Alternative Investment Fund
AUM	Assets Under Management
DFIs	Development Finance Institutions
ELSS	Equity-linked Savings Scheme
ESG	Environmental, Social, and Governance
EVs	Electric Vehicles
FoF	Fund of Funds
GSSS	Green, Social, Sustainability, and Sustainability-linked Bonds
ICE	Internal Combustion Engine
InvITs	Infrastructure Investment Trusts
IPO	Initial Public Offering
IRDAI	Insurance Regulatory and Development Authority of India
IREDA	Indian Renewable Energy Development Agency
LLR	Loan Loss Reserve
MSME	Micro, Small, and Medium Enterprises
NBFC	Non-Banking Financial Company
NDC	Nationally Determined Contribution
NGGC	National Green Guarantee Corporation
PCG	Partial Credit Guarantee
PPA	Power Purchase Agreements
PRG	Partial Risk Guarantee
REIT	Real Estate Investment Trust
SEBI	Securities and Exchange Board of India
SIDBI	Small Industries Development Bank of India
SPV	Special Purpose Vehicle

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Executive summary

India's commitment to green transition requires an unprecedented scale of capital investment over the coming decades. This includes investment in renewable power, transmission, storage, low-carbon industries, clean transportation, and more energy efficient buildings. The goal is to achieve these while ensuring growth, energy security, and competitiveness. Estimates from institutions such as NITI Aayog, the Council on Energy, Environment and Water, and McKinsey suggest a total investment of USD 10–22 trillion across different timelines over the next 25–50 years—roughly USD 200–400 billion in additional annual investment in green assets sustained over decades.

The recent NITI Aayog estimate puts the cumulative investment requirements for the net-zero transition at USD 22.7 trillion by **2070**, with an expected financing shortfall of **USD 6.5 trillion**. The same study suggests that capital requirements for net zero by 2050 alone will exceed USD 8 trillion, leaving a nearly USD 2.5 trillion gap. Previously, green projects carried a higher risk and were therefore less capital deployable; however, going forward, there might be large capital pools but even larger financing needs, leaving them insufficient relative to total demand. This report focuses on how a large volume of capital can be mobilised from institutional investors for the green transition over 2026-50.

Financing needs and gaps are not uniform across sectors. The power sector has the largest requirement, at **USD 4.3 trillion through 2050**, accounting for about 54% of total net-zero financing needs, with a financing gap of ~USD 2 trillion. The sector's heavy reliance on bank and non-banking financial company (NBFC) for debt financing is already approaching structural limits, which puts capital-market instruments at the centre of the next phase of financing. Comparatively, the transport sector faces a smaller absolute gap of about USD 220 billion over the 2026–2050 period, driven primarily by the shift from combustion vehicles to electric and hydrogen vehicles. Meanwhile, industries require USD 2.2 trillion cumulatively over the 2026–2050 period but face a gap of nearly USD 0.3 trillion. Hard-to-abate sectors such as steel, cement, and chemicals need patient equity first, followed by debt later as transition pathways mature. 'Green buildings', a demand-side component of green transition, will require a massive volume of long-term, low-cost debt from the financial system.

Currently, India's green transition depends heavily on banks and NBFCs for debt capital, and on corporate balance sheets and foreign investors for equity capital; however, each of these channels has clear limits. Bridging this gap will therefore require mobilising capital from domestic institutional investors (insurance companies, pension funds, and mutual funds); these investors manage a combined volume of USD 2.1 trillion in assets under management (AUM), which is hardly used today for the green transition.

According to our estimate, these investors could contribute about **15% (USD 1.2 trillion)** of total green finance needs between 2026 and 2050. They are structurally suited to provide long-term capital, whereas banks face asset-liability mismatches if too much capital is allocated to long-duration loans, the kind of capital several green technologies need. Mature, contracted assets such as utility-scale solar, wind, transmission lines, and other infrastructure-like projects align well with the long liability profiles of insurers and pension funds.

Mutual funds, because of their flexibility, can offer short- to medium-term capital to meet the financing needs of certain green sectors, such as clean transportation. As these investors can offer various types of capital through a wide range of financial instruments (e.g. public equity, bonds, and alternative investment funds [AIFs]), they can play a crucial role in meeting the diverse financing requirements of the green transition.

However, institutional portfolios remain too conservative and heavily concentrated in sovereign and quasi-sovereign assets to fully support the green transition. Pension funds and insurers are constrained by liability-driven mandates, rating thresholds, and limited appetite for lower-rated or early-stage green assets. Although mutual funds have greater flexibility, they still need deeper product innovation and clearer green pathways. Green projects often remain too small, too new, or too risky for current mandates. This is why credit enhancement, guarantees, partial risk support, blended finance, and structured vehicles matter. They can move projects into the investable zone and match risk with the right investor. Green Infrastructure Investment Trust (InvITs) and securitisation can also turn illiquid assets into tradable instruments that fit institutional portfolios.

> **By lowering perceived risks / return objectives and encouraging product innovation, long-term institutional capital can be channeled to fund green projects.**

While risk-mitigating mechanisms such as guarantees, loan loss reserves, and blended finance can reduce the riskiness of green assets, alternative financial instruments such as securitisation, InvITs, and AIFs can make green projects investable (Table ES1). All these measures must be backed by clearer regulation, better data, and calibrated incentives. The task ahead is to create the conditions for institutional investors to move beyond passive allocation and finance India's green transition ambitions.

Table ES1. Overview of financing instruments, their risk, and mitigating mechanisms

Modes of investment	Inherent risks in financing	Risk mitigation instruments
Equity	Credit risk	Partial credit guarantees (PCGs)
Bonds	Policy / regulatory risk	Partial risk guarantees (PRGs)
Alternative investments (Securitisation, InvITs, AIFs)	Off-taker / counterparty risk	Loan loss reserves (LLRs)
	Technology / performance risk	Blended finance
	Merchant / market price risk	Performance insurance
	Construction risk	

Source: CSI analysis

Policy interventions and risk-mitigation solutions are central to unlocking institutional capital for green and transition assets by reducing perceived risks, improving bankability, and expanding investor participation. However, solutions address different types of risks and barriers across technologies, asset classes, financing structures, and project stages. Table ES2 offers an assessment of each solution across two dimensions: (a) feasibility and (b) effectiveness and scalability.

Table ES2. Risk mitigation instruments and policy interventions: Feasibility; Effectiveness and Scalability

Risk mitigation instruments	Feasibility	Effectiveness and Scalability	Solutions	Feasibility	Effectiveness and Scalability
Partial credit guarantees	High	High	**Green Asset Securitisation**	High	High
Partial risk guarantees	Moderate	High	**Green InvITs / Green REITs**	High	High
Loan loss reserves	Moderate	Moderate	**Green AIFs**	High	Moderate
Blended finance	Moderate	High	**Preferential tax treatment on 'green finance' instruments**	Moderate	Moderate
Performance insurance	High	Moderate	**Minimum investment mandate in green assets**	Moderate	High

Source: CSI analysis

The allocation of domestic institutional capital in green asset requires regulatory and policy interventions, as well as market innovation. By lowering perceived risks and encouraging product innovation, capital from institutional investors can be mobilised for green assets. This support helps India reach its green transition objectives while ensuring economic resilience.

> **The task ahead is to create the conditions for institutional investors to finance India's green transition ambitions.**

1. Background and context

India is currently transitioning to a green, sustainable economy while aiming to grow rapidly and build resilience. In March 2026, the updated Nationally Determined Contribution (NDC) for 2031–2035 set more ambitious climate goals, aiming to cut the Greenhouse Gas (GHG) intensity of its economy by 47% by 2035 compared to 2005, and to boost non-fossil capacity to 60% of electric power installed capacity by 2035. India has already made significant progress towards achieving its NDCs, reducing its emissions intensity by 36% between 2005 and 2020 and achieving 52.6% non-fossil electric power capacity by February 2026 (Press Information Bureau, 2026).

In the next 25-45 years,[1] India is set to significantly expand its renewable energy capacity, accelerate the adoption of electric and other low-emission vehicles, scale up charging infrastructure and green hydrogen facilities, and retrofit or build low-carbon-intensive manufacturing facilities and buildings. This structural economic transformation requires large-scale investments of USD 10–23 trillion, according to estimates from various agencies. A report by NITI Aayog (2026) states that India faces a USD 6.5 trillion financing shortfall to achieve its net-zero goal.

India is unlikely to close this gap through public finance, bank and NBFC led alone, without diverting resources from other growth and development priorities. Bridging this gap will require mobilising significantly higher pools of long-term capital, especially from institutional investors.

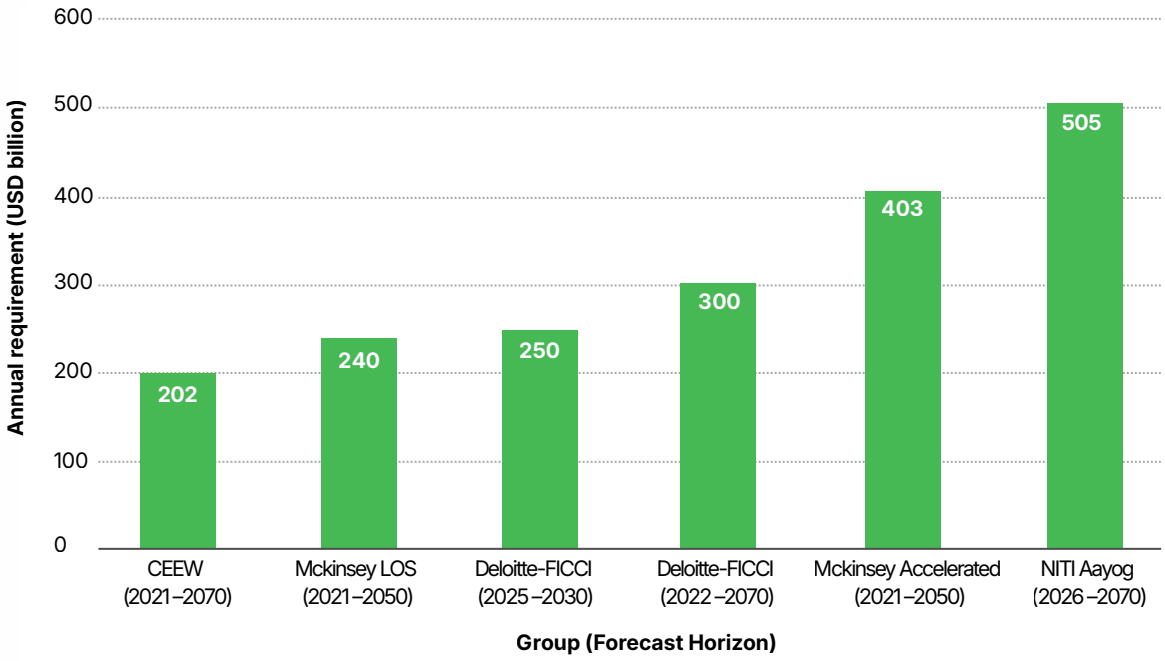
This report examines how institutional investors' capital in India can be oriented to green sectors through appropriate policy and regulatory interventions and the smart use of innovative financial instruments.

[1] Different studies and transition pathways assess India's net-zero trajectory across varying timelines, including 2050, 2060, and 2070 scenarios.

2. India's financing requirement for net-zero

India's ambition to achieve net zero requires adding enormous renewable energy capacity, along with associated infrastructure (e.g., transmission, green hydrogen, carbon storage, and energy storage), which requires mobilising green finance[2] on a much larger scale than today, at a faster pace. The cumulative estimated investment requirements for India's green energy transition and net-zero targets, as available in the public domain, are on the order of trillions of dollars over the next 4–5 decades (Figure 1). Although **estimates vary widely depending on assumptions, there is consensus that India needs a massive volume of capital for its green transition.**

Figure 1. Annual financing requirements for India's net-zero 2070 transition



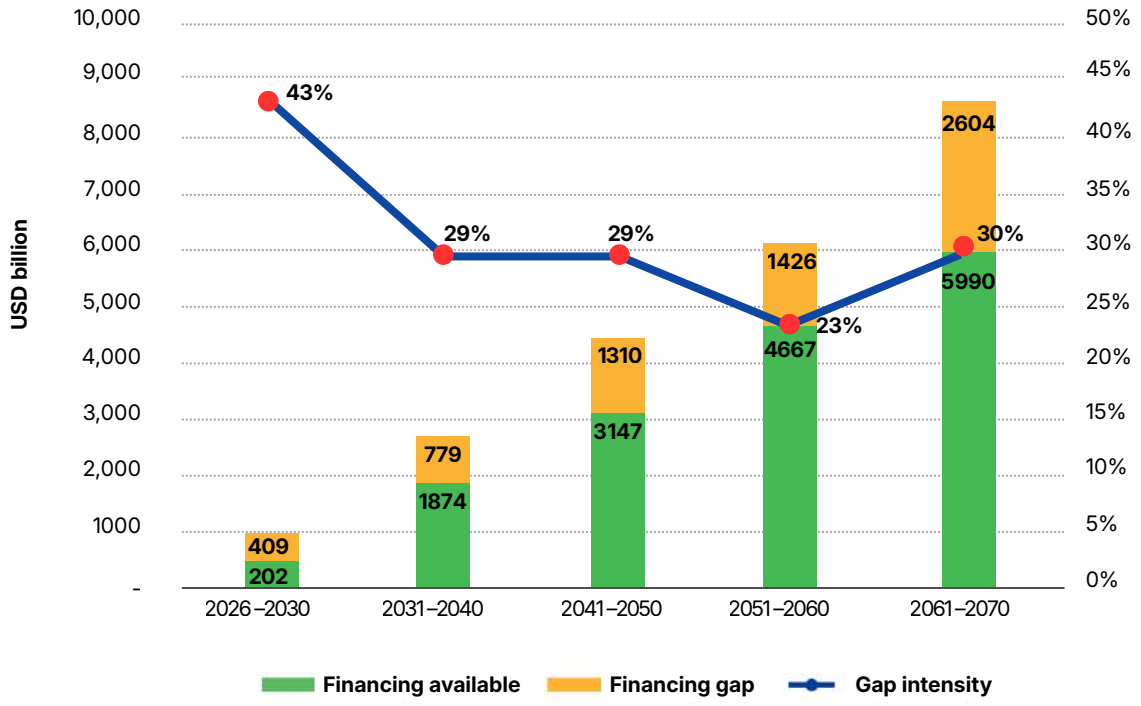
Source: CSI analysis based on estimates by various agencies.

[2] We have only considered climate mitigation technologies in this report.

> **Over the next 25–50 years, India needs roughly USD 200–400 billion in additional annual investment in green assets sustained over decades.**

Between 2026 and 2050, investment requirements in the power sector alone are estimated at USD 4.32 trillion; this figure goes up to USD 8 trillion between 2051 and 2070. The power sector faces the largest gap (about USD 1.98 trillion), while transport and industry gaps remain relatively smaller over 2026–2050. Over the longer horizon (2026–2070), the financing gaps widen substantially, with the power sector's gap increasing sharply by about USD 5.40 trillion, indicating huge capital requirements in the later years.

Figure 2. Projected investment requirement and financing gap for net zero

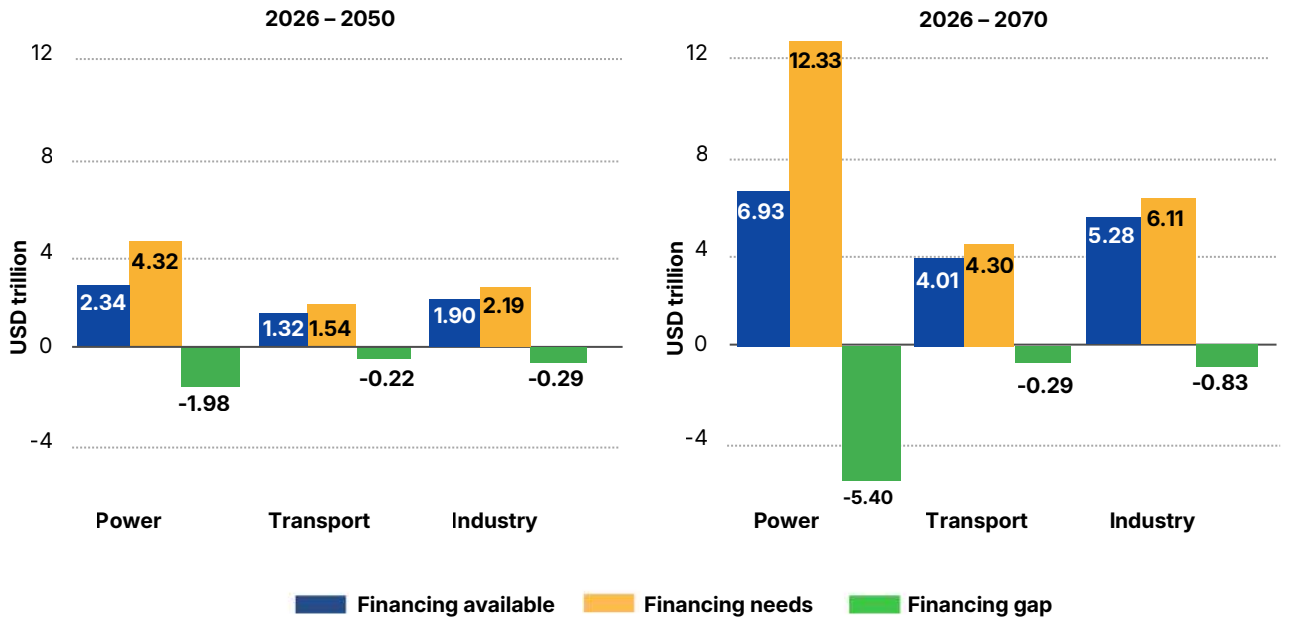


Note: Gap intensity represents the financing gap as a percentage of total financing required during the respective decade.
Source: NITI Aayog, 2026; CSI analysis

Capital requirements and challenges for different sectors

The financing gap for India's net-zero transition spans three key segments (see Figure 3) that are necessary for significant decarbonization in both the medium term (2026–2050) and the long term (2026–2070). The gap is concentrated in the power sector, given the heavy capital investment required to electrify the energy sector.

Figure 3. Sector-wise financing requirements and gap



Source: NITI Aayog, 2026 ; CSI analysis

2.1 Power

The power sector includes renewable generation assets, transmission, distribution, and storage. The power sector needs USD 12.33 trillion in 2026–2070, of which USD 4.32 trillion is required in 2026–2050; the power sector's capital requirement is approximately 54% of the total capital requirements for net zero (NITI Aayog, 2026). Between 2026 and 2050, the financing gap in the power sector is estimated to be around USD 2 trillion, making up 80% of the overall shortfall.

The enormous gap indicates the sector's heavy reliance on banks and non-banking financial companies (NBFCs) for debt financing; these primary sources are likely to face their own constraints in funding the power sector over time. To meet its long-term needs, the power sector must increasingly raise capital from institutional investors through bond markets and other capital market instruments for more scalable debt financing, while also freeing up bank and NBFC capital for redeployment into new projects. Banks have the capacity to scale up, given the ample liquidity currently available to them, but in the medium and long term, that will not be enough to fund the energy transition. Beyond contracted renewable assets backed by strong power purchase agreements (PPAs), many power-sector investments, such as storage and distribution infrastructure, do not generate stable or predictable cash flows in their early years. This variability heightens debt-servicing risk and limits the suitability of leveraged financing. As a result, long-term patient equity capital is critical for absorbing construction, regulatory, and utilisation risks upfront and reducing balance-sheet stress for developers.

2.2 Transport

Clean transportation primarily involves purchasing of and developing the supply chain (e.g., manufacturing) for electric vehicles (e.g., cars, buses, trucks, ships, and aircraft), fuel-cell electric vehicles, and higher-blend or low-carbon fuels. The transportation sector needs USD 4.3 trillion from 2026 to 2070, with USD 1.54 trillion required between 2026 and 2050, representing 19% of the total green capital required during this period. The gap intensity will be very high during this period, with a shortfall of USD 220 billion out of the total USD 290 billion expected until 2070. This gap is driven by both the purchase of low-carbon vehicles and vehicle manufacturing.

While the purchase of low-carbon vehicles would be mostly funded by banks and NBFCs, a significant portion of the capital requirement would be met by institutional investors through bonds (e.g., airlines and shipping companies issuing bonds) and alternative assets (e.g., securitisation and AIFs, discussed in detail in Section 6 under **Alternative assets**).

The current and near-term financing gap in the manufacturing segment of the clean transportation sector can be effectively bridged through equity capital that backs early-stage manufacturing, platform build-out, and ecosystem creation, where revenues scale only after adoption inflects. A few EV manufacturers with limited balance sheets and no internal capital markets have raised equity capital from the capital market to fund R&D, localised supply chains, charging networks, and brand-building. By absorbing technology, market-adoption, and execution risks upfront, equity capital can crowd in low-cost debt capital from institutional investors as the sector matures.

2.3 Industries

The industrial sector requires investments in electrifying plants and machinery (which are now dependent on fossil fuels), energy efficiency, and green hydrogen. The key sectors to decarbonise the industrial sector are iron and steel, cement, and chemicals, often called hard-to-decarbonise industries. The industrial sector needs USD 6.11 trillion from 2026 to 2070, with USD 2.19 trillion needed between 2026 and 2050. This accounts for 27% of the green capital needed during this period and indicates a shortfall of USD 290. Although energy-efficient technologies are commercially viable and widely adopted by large corporations, micro, small and medium enterprises in the industrial sector struggle to raise capital to adopt them; the latter will continue to rely on public finance support to implement efficiency measures. Large corporations can use their balance sheet capital and raise fresh capital (by issuing bonds and equity) to build plants that can run on renewable energy—for example, the steel industry is investing in electric furnaces. The challenge will be the adoption of green hydrogen, which will take longer to become commercially feasible and largely hinges on carbon pricing and public finance support, and technical progress.

2.4 Buildings

India's building floor space will grow from 17.8 bn m^2 (2020) to 42.5 bn m^2 (2070), and 86% of the 2070 building stock is yet to be built. The building sector's energy demand side must be managed smartly to reduce energy needs. Energy-efficient new construction requires additional upfront capital (International Finance Corporation, 2023), whereas retrofits demand one-time capital expenditures for existing structures (Bleyl et al., 2019). Both scenarios feature upfront expenses with long-term financial benefits, necessitating low-cost, long-term debt capital in which net benefits exceed capital costs over the asset lifecycle. The mature technology base and proven operational savings make these investments suitable for institutional investors.

In contrast to buildings, AI data centres, which consume enormous amounts of energy, are high-growth, technology-driven assets. However, future cash flows remain uncertain yet potentially outsized, making equity capital more suitable in the early stages. As these businesses mature and cash flows stabilise, they can increasingly attract long-term debt capital from institutional investors.

3. Overview of the institutional investors' landscape in India

Given India's estimated climate financing gap of USD 6.5 trillion cumulatively for the climate transition by 2070, it **cannot be addressed through public resources alone** due to fiscal constraints, with debt-to-GDP ratios exceeding **55%** (Press Information Bureau, 2025b). Institutional investors, managing combined assets of **USD 2.1 trillion** (approximately **INR 177 trillion** as on FY 2025 end), represent an enormous and untapped domestic capital source capable of scaling to meet these requirements (see Table 1).

This assets under management (AUM) is projected to reach **USD 34 trillion** (approximately **INR 4,031 trillion** by 2050), driven by economic growth and a gradual shift in household savings from traditional bank deposits towards pension, provident, insurance, and mutual fund investments.

Their role as intermediaries between households and users of capital (corporates) makes them essential catalysts to build green transition, capable of transforming fragmented savings into concentrated capital flows for climate solutions.

Table 1: Institutional investor asset growth projections

Institutions	FY 2025		FY 2050		CAGR[a]	
	INR trillion	USD billion[b]	INR trillion	USD billion[c]	2022–2025	2025–2050
EPFO	23	271	412	3,484	13%	12%
NPS	14	164	576	4,869	28%	16%
Insurance	74	871	901	7,614	12%	10%
Mutual funds	66	769	2,141	18,092	24%	15%
Total	**177**	**2,074**	**4,031**	**34,058**	**17%**	**13%**

Note: [a]CAGR: compound annual growth rate. The average annual growth rate of an investment over a period, assuming steady compounded growth.[b]Conversion ratio: 1 USD = INR 85.5 (ValutaFX, 2025).[c]Conversion ratio: 1 USD = INR 118.36 (projected).

*Source: CSI analysis (see **Annexure 1 for methodology**); NITI Aayog, 2026; Employees' Provident Fund Organisation (EPFO), 2025; National Pension System Trust, 2026; Press Information Bureau, 2025a; and Association of Mutual Funds in India, 2025.*

Institutional investors, particularly pension funds and insurance companies, operate under liability-driven mandates and regulatory frameworks, which shape their investment behaviour. **Their preference for long-duration, stable-return assets naturally aligns them with green infrastructure.** However, risk aversion, regulatory constraints, liquidity needs, and a preference for traded securities constrain their full participation in India's green transition.

Since most net-zero technologies require medium- to long-term financing, institutional investors—such as insurance funds, pension funds, and mutual funds—are well-suited to meet their funding needs. The investment characteristics of institutional investors align closely with those of mature, capital-intensive technologies that offer stable, predictable cash flows over long periods. Allocating long-term institutional capital to these assets can support large-scale deployment while improving overall capital efficiency in the system. Several green technologies, not yet fully commercialised, require risky capital but offer higher return potential. Private equity or venture capital investors, the two key classes of investors, are suitable to invest in these technologies that should exit mature assets and redeploy capital towards risky green technologies; the capital market is a suitable medium for these investors to exit. At the same time, banks can offload their heavy exposure to these sectors to avoid asset-liability mismatch and concentration risk.

> **Mobilising capital from institutional investors, managing a combined volume of USD 2.1 trillion in assets under management (AUM), which is hardly used today for the green transition, can bridge the financing gap significantly.**

Pension funds and insurance companies

Pension funds (AUM: **INR 37 trillion**) and insurance companies (AUM: **INR 74 trillion**) are **liability-driven institutions that prioritise stable, long-duration investments aligned with their future obligations**. Their portfolios are traditionally concentrated in government securities, which account for about 60% of their holdings (Department of Economic Affairs, 2025).

While the balance is held in listed equities, infrastructure bonds, and investment-grade corporate debt; they also invest, although with a small exposure, in alternative assets (e.g., alternative investment funds/private equity, or InvITs). These institutions primarily finance either through bonds (project or corporate) or public equities. Listed renewable energy companies have successfully raised capital through equity offerings and corporate bonds from these institutional investors, although the amount is significantly small compared to the requirements.

3.1 Pension funds – National Pension System

The National Pension System (NPS) operates under a regulated investment framework, allowing subscribers to select their investment option and pension fund manager. Where no choice is made, contributions are invested under a default life-cycle-based strategy (Pension Fund Regulatory and Development Authority [PFRDA], 2026). Overall, portfolio construction reflects a cautious risk profile, with a strong preference for high-quality debt instruments (Table 2).

The key regulation on investment in NPS fund is a minimum credit rating requirement (typically AA or above)[3] and a preference for safer assets over returns. While regulations permit up to **5% allocation to alternative assets, actual exposure remains significantly lower at 0.2%.**[4] This gap is important, as many innovative investment vehicles and non-traditional infrastructure projects are structured as “alternative investments”. Together, these constraints narrow the investible universe and limit capital flows to emerging or sub-investment-grade green projects. While NPS has adopted a stewardship code for responsible investing, disclosure and enforcement around climate risk integration remain limited (Usthadian Academy, 2025).

[3] Exception: up to 10% of AUM may be invested in AA– to A– rated securities, with additional exposure requiring credit default swaps coverage.
[4] CSI calculation based on SBI, LIC, and UTI pension funds.

Table 2: Pension fund: Asset allocation and regulation

Institution Name	NPS		EPFO	
Asset Class	Maximum limit	Actual allocation	Range	Actual allocation
Government securities and related investments	65%	58.0%	45–65%	68.8%
Debt instruments and related investments	45%	23.9%	20-45%	18.7%
Short-term debt instruments and related investments	10%	3.2%	0-5%	1.7%
Equities and related investments	25%	14.7%	5–15%	10.6%
Asset backed, trust structured and miscellaneous investments	5%	0.2%	0-5%	0.2%

Note: NPS regulatory limit applies to CG, SG , Corporate CG, NPS Lite, and Atal Pension Yojana schemes. This excludes equity schemes, which invest ~99% in equity and form only ~2.5–3% of the total NPS portfolio. EPFO limits apply to fresh inflows, while NPS limits apply to the entire portfolio, which must remain within prescribed limits and be rebalanced if required. Timeline: NPS: May 2025 (based on the portfolio allocation of the top three NPS funds—LIC, SBI, and UTI—which represent approximately 94% of the total NPS); EPFO: December 2025.

Source: CSI analysis (see Annexure 1 for methodology); PFRDA, 2023; The Times of India, 2026.

3.2 Pension funds – Employees' Provident Fund Organisation

EPFO investments are centrally managed and governed by a statutory investment framework. Individual subscribers do not select schemes or asset classes; instead, all contributions are pooled into a single corpus. Asset allocation is prescribed by the Government of India under the EPF Investment Guidelines and executed by empanelled professional fund managers within those regulatory limits.

EPFO asset allocation (Table 2) is **dominated by sovereign and quasi-sovereign debt.** The current portfolio allocation shows that government securities (68.8%) exceed even the intended notified regulatory range (45–65%), while corporate debt allocation (18.9%) falls below the prescribed lower limit (20%). This deviation arises because the limits apply to fresh inflows, and Table 2 reflects the actual accumulated portfolio (EPFO, 2018). If this 1.1% shortfall in corporate debt were addressed by reallocating corpus from government securities to AA– rated bonds issued by green companies, it would inject nearly INR 253 billion into green investments. Equity exposure is capped at 15%, and even that is restricted to a few regulatory-approved exchange-traded funds (ETFs) and cannot invest directly in individual companies. This leaves little scope for them to participate as equity investors in green technologies. It highlights the need for improved asset management and gradual diversification of the corpus into a broader set of assets, including corporate debt, equity, and alternative assets.

3.3 Insurance companies

The **investment objectives** of India's insurance sector **closely mirror those of pension funds, with long-term liabilities, conservative mandates, and a strong emphasis on capital preservation**. Life insurance companies have historically set investment horizons of 2–40 years (Jena et al., 2018), which naturally align with the tenors of renewable energy and infrastructure projects. As with pension funds, insurers adopt a liability-driven approach, emphasising safety and predictable returns to match insurance holder obligations (see Table 3).

This allocation reflects both risk aversion and regulatory mandates. The Insurance Regulatory and Development Authority of India (IRDAI) requires a minimum 15% allocations to infrastructure and housing, which creates a natural regulatory lever for green technologies, often characterised as infrastructure assets (The Economic Times, 2025). Importantly, IRDAI has classified sovereign green bonds as infrastructure investments, providing insurers with a direct, regulatory-compliant pathway into green-aligned projects. However, challenges associated with heavy capital investment requirements in the infrastructure and housing sectors, which exceed the minimum 15% allocations, limit capital flows to green sectors.

Table 3: Asset allocation of insurance companies

Asset class	Public insurance company	Private insurance company	Weighted average
Government securities	61%	31%	53%
Infrastructure and social sector investments	8%	11%	9%
Equities	25%	25%	25%
Debentures/ bonds	3%	4%	3%
Others (approved and other investments)	3%	29%	10%

*Source: CSI analysis (see **Annexure 1 for methodology**).*

Note: The analysis is based on life insurance companies, which represent 91% of total insurance AUM. Public insurers account for 72% of life insurance AUM, compared to 28% for private insurers.

3.4 Mutual funds

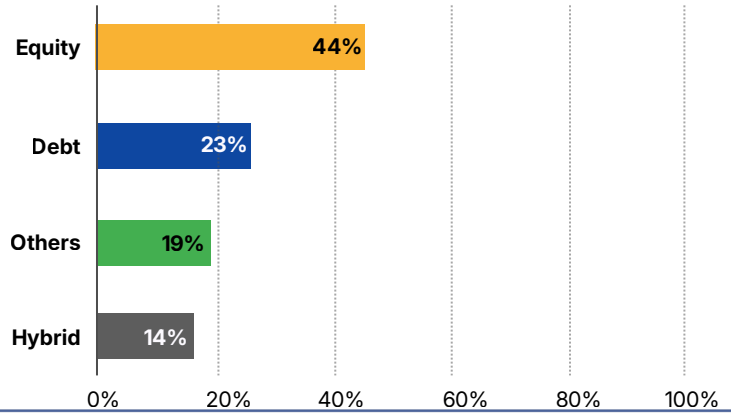
India's mutual fund sector is the most dynamic and versatile segment of the institutional investor's landscape, with assets under management reaching **INR 82 trillion (~USD 900 billion) as of Feb 2026**. The sector has expanded nearly six-fold between February 2016 (INR 12.63 trillion) and February 2026, growing at a **CAGR of ~20.6%** (Association of Mutual Funds in India, 2026), driven by rising household participation and financial deepening.

Unlike pension funds and insurers, **mutual funds invest through scheme-level mandates rather than a single institutional balance sheet**. Regulations issued by the Securities and Exchange Board of India (SEBI) require schemes to be classified into defined categories such as equity, debt, hybrid, solution-oriented, and other schemes, each with prescribed investment limits (see Figure 4). For example, an **equity-oriented scheme** must hold **at least 65%** of its assets in equity and equity-related instruments, or may allocate up to 100% of its assets to equity (INDmoney, 2026).

Also, unlike pension funds and insurers that are largely fixed-income–oriented, **mutual funds' equity-heavy portfolios and structural flexibility position them as critical vehicles for scaling green finance by leveraging diverse risk appetites**. Beyond listed markets, they can also participate in growth-stage green technologies through venture capital fund investments and green REITs, providing flexible capital across different technology maturity stages with medium- to long-term investment horizons. The total assets managed under environmental, social, and governance (ESG) schemes as of 2025 exceed INR 11,000 crore (WERT Finserve, 2025); under SEBI's 2023 guidelines, at least 80% (ESG Today, 2023) of the fund's assets must be allocated to ESG strategies. This makes ESG an emerging and important channel for directing both retail and institutional capital towards green investments.

Through Fund of Funds **(FoFs)**, mutual funds can also access private market investments. Alternative Investment Funds (AIFs) act as key intermediaries for accessing these investments. **Category I AIFs** provide exposure to early-stage climate technologies and startups requiring patient capital while **Category II AIFs** provide exposure to mid- to late-stage projects, including renewable energy, storage, and industrial low-carbon transition projects.(SEBI, 2016) (discussed in detail in Section 6 under Alternative Investment Funds)

Figure 4. Mutual fund allocation: Investment orientation



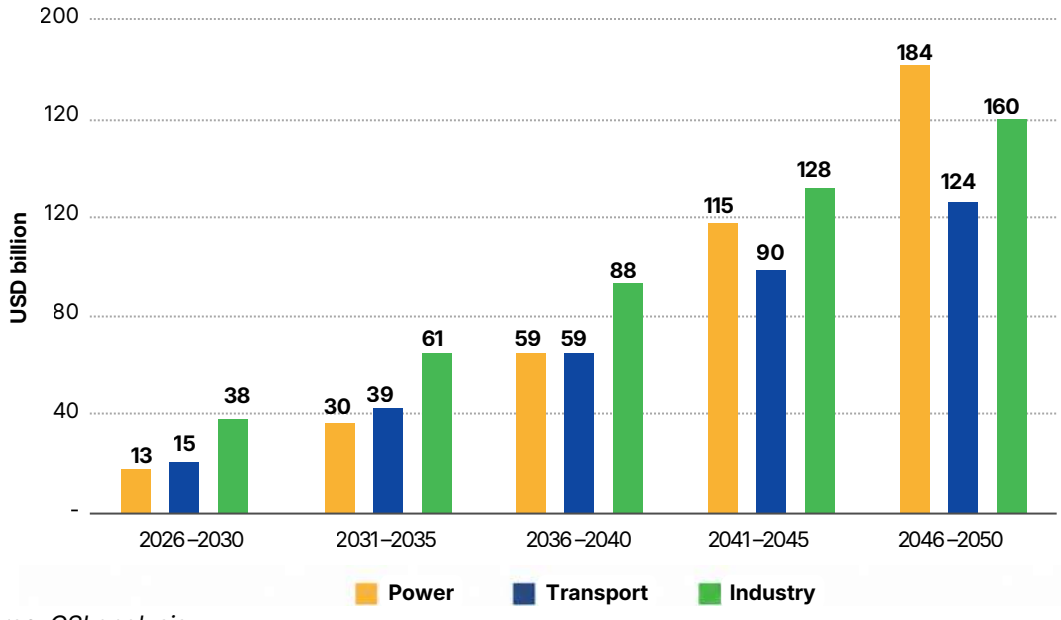
Source: CSI analysis

In India, ESG mutual fund AUM remains heavily concentrated in exclusionary strategies, which account for over 70% of total ESG AUM (ET Money, 2026). These funds primarily rely on negative screening and disclosure-based selection, so they tend to reallocate capital to companies with stronger disclosure practices. Tax incentives can be given for ESG funds investing in pure green assets in line with the climate finance taxonomy being developed by the Ministry of Finance. Tax incentives can improve risk-adjusted returns, thereby attracting investors. Such incentives must be time-bound, allowing the market to build liquidity and depth in green securities and make these securities mainstream financial investments among institutional investors.

4. Availability of institutional finance for the green sector

Based on our projections, the **estimated aggregate green finance from institutional investors between 2026 and 2050 will be USD 1.2 trillion, accounting for ~15% of total green finance needs** (see Figure 5). Please refer to **Annexure 1 for the detailed methodology.** Capital availability is expected to increase, driven by rising GDP and savings, and by a shift in household preferences from bank deposits to institutional investment products (e.g., pension and insurance products, and mutual funds). With greater availability of capital from institutional investors and a wide range of investment instruments, the green sector can mobilise significant capital from these investors. Regulatory liberalisation on investment management, product innovation (e.g., green bonds, InvITs, and AIFs) and stronger stewardship can further unlock long-duration institutional capital for green sectors.

Figure 5. Institutional green finance flows (2026–2050)

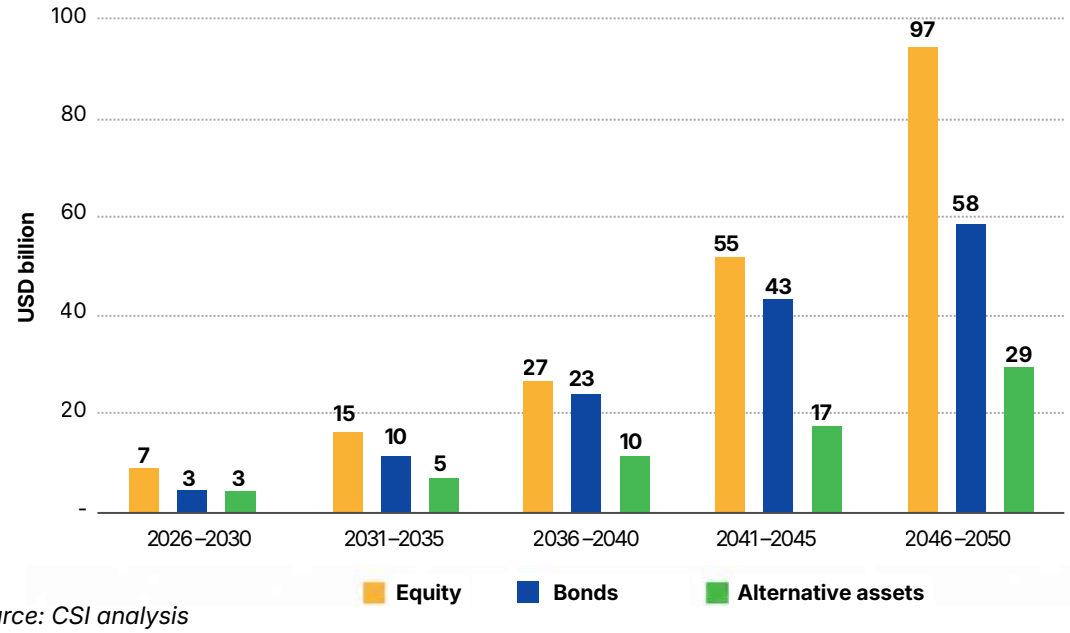


Source: CSI analysis

4.1 Power

According to our estimates, institutional investors are expected to invest **USD 402 billion** in the green power sector between 2026 and 2050 (Figure 6). Multiple structural factors will drive this growth. First, as India's corporate bond market deepens, the power sector can raise more debt capital. Second, more renewable energy and energy storage companies are expected to list on the stock market, enabling them to raise equity capital from institutional investors.Third, as electrification accelerates, investors' exposure to the oil and gas sector would decline, while their exposure to the power sector would increase. Finally, institutional allocation to alternative assets is expected to increase; a significant portion of that capital can be deployed in the power sector (e.g. transmission lines) through various financial instruments (AIFs, YieldCos [5], and securitisation).

Figure 6. Power sector: Institutional finance available



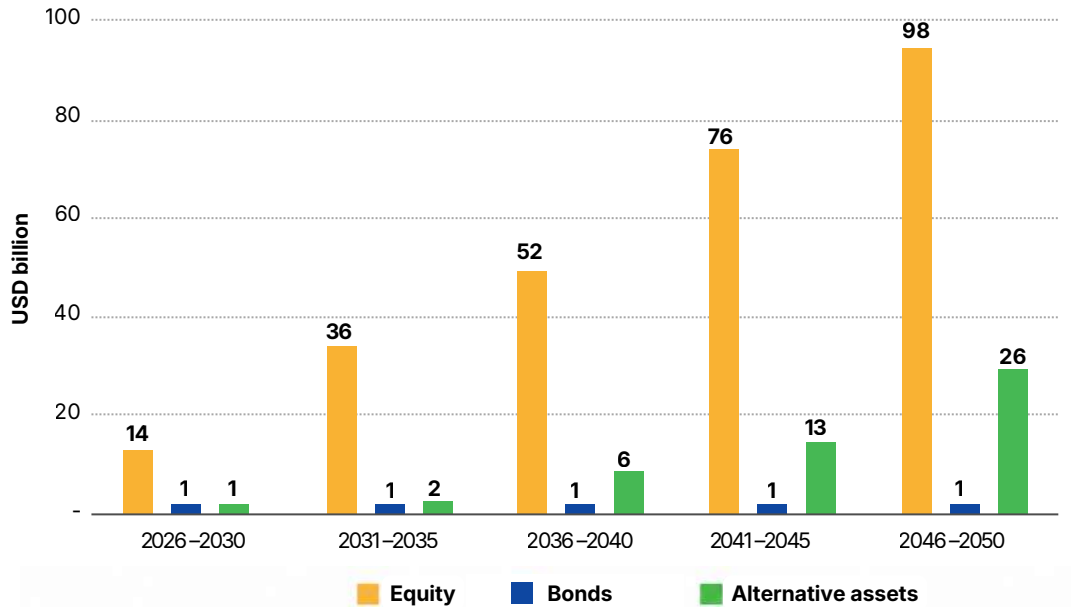
Source: CSI analysis

[5] YieldCos are investment vehicles that own operational infrastructure assets and distribute their cash flows to investors (e.g., InvITs and REITs).

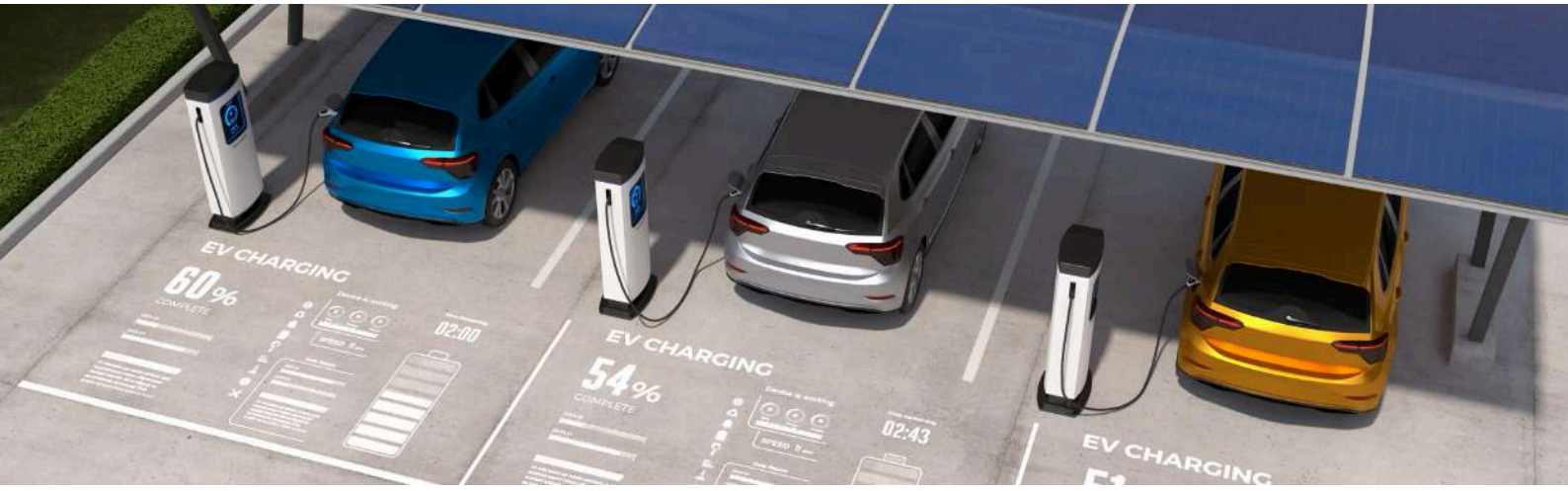
4.2 Transport

Institutional investors are projected to invest **USD 327 billion** into the green transport sector between 2026 and 2050 (Figure 7). Structural shifts in technology and policy drive this growth. Capital allocation is expected to shift from internal combustion engine (ICE) vehicles towards electric vehicles (EVs) and emerging technologies, including hydrogen-based mobility and low-carbon aviation fuels such as sustainable aviation fuel. Strong policy support and regulatory push have accelerated both new market entrants and the transition of incumbent manufacturers, expanding investment opportunities. Equity is expected to dominate the financing mix at around 84%, reflecting higher technology, adoption, and execution risks. Alternative assets are expected to grow rapidly through the securitisation of EVs and fleet loans, enabling institutional participation via structured investment channels. However, debt financing remains limited, as EVs and charging infrastructure assets currently lack the long-tenor contracted cash flows that the bond markets require.

Figure 7. Transport sector: Institutional finance available



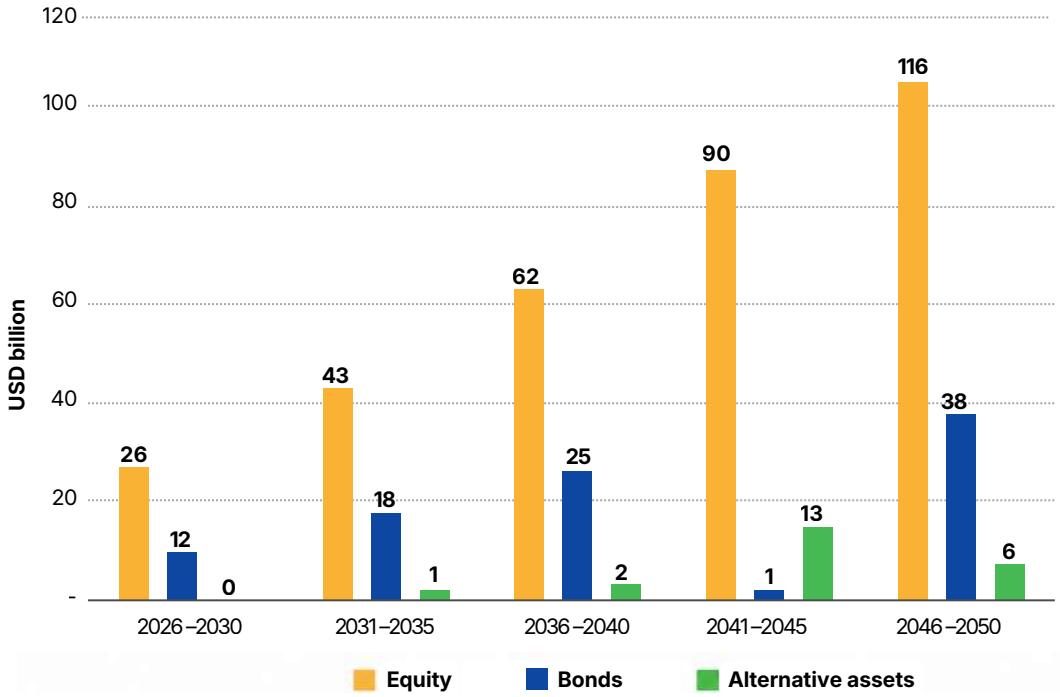
Source: CSI analysis



4.3 Industries

Institutional investors are projected to invest **USD 476 billion** into the green industry sector between 2026 and 2050 (Figure 8). Industrial decarbonisation is the most capital-intensive component of India's net zero transition, concentrated in hard-to-abate sectors such as steel, cement, and chemicals, and characterised by long investment cycles. As India's manufacturing base scales towards Viksit Bharat, industrial firms will face growing pressure to decarbonise, both from domestic regulations and from export-market demands regarding embodied carbon. Unlike power, where returns are largely contracted, industry decarbonisation involves higher technology risk and longer payback periods, requiring patient equity capital, which accounts for 71% of the finance mix. As transition pathways become clearer and financing structures mature, corporate bonds and alternative assets allocations are expected to grow, improving the overall risk-return profile and attracting greater institutional participation.

Figure 8. Industries sector: Institutional finance available



Source: CSI analysis

5. Strategic alignment of institutional investments with green financing

The ability of institutional investors to finance the green transition depends on how well their mandates, liability profiles, and fiduciary obligations align with the characteristics of green assets. Renewable energy, transmission, storage, and industrial transition projects require long-term, patient capital, which aligns naturally with their long-investment horizons and liability structures of pension funds and insurers.

Mutual funds, given their flexibility, can deploy short- and medium-term equity capital across emerging green sectors. Climate change represents both a material risk to long-term portfolio performance and a significant investment opportunity. While higher exposure to green assets can reduce climate-related transition risk for institutional investors, early entry in the sector can enable them to generate higher returns as the sector grows.

5.1 Pension funds

Pension funds' long-term horizons make them a natural source of patient capital for long-duration assets such as renewable energy and the industrial sector. However, conservative mandates and regulatory caps continue to constrain their participation in the green transition.

Alignment

The regulated asset allocation allows them to increase their allocation significantly to equity, corporate bonds, and alternative investment assets (e.g., AIFs and InvITs). Within each asset class, they also invest in a variety of sectors, including energy, transportation, and industry. The green economic transformation will also change the attractiveness, valuation, and credit profile of these sectors, thereby attracting more capital from pension funds.

Long-duration maturities (e.g., SBI pension funds average ~7.5 years and above)[6] **match the medium- to long-term horizons of the clean energy, transportation, and industrial sectors**. Since the transition impact of climate change will be realised over the long term, investing in these sectors will enable them to build more climate-resilient portfolios and possibly generate higher returns than the broader market.

Liability-driven design seeks stable, inflation-linked returns, which are significantly compatible with green infrastructure cash flows. They would prefer to invest in safe sectors, even at the expense of lower returns, although some pension schemes are heavily allocated to equity securities. The clean energy supply chain is in the utility sector, so it carries lower risk than the broader financial market. The transportation sector is considered to be a safe investment, while the industrial sector is moderately safe. Besides, other green sectors such as water treatment, recycling, and waste-management utilities provide stable, regulated, and inflation-linked cash flows similar to energy utilities, making them natural complements for liability-driven institutional capital while also mitigating environmental and operational risks across the clean energy ecosystem.

01 Stichting Pensioenfonds ABP, Netherlands

ABP, Europe's largest pension fund with more than EUR 500 billion in AUM, has tilted its portfolios towards climate-aligned investments while meeting regulatory requirements and fiduciary objectives. In 2021, ABP committed to invest EUR 15 billion in clean and affordable energy by 2025. It achieved the target ahead of schedule by investing EUR 20.4 billion by 2023. It has now revised its commitment to invest EUR 30 billion in the climate transition by 2030. The decision was grounded in fiduciary duty: ABP must deliver reliable pensions and therefore seeks solid returns through investment in a stable, resilient economy. Its leadership argued that, as a long-term investor, ABP should back companies that can remain viable for decades—firms unwilling or unable to adapt to climate change no longer meet that test. ABP also stressed that progress cannot wait for perfect information, and it has developed new methods to measure impact while working towards a net-zero portfolio by 2050 (ABP, 2024).

[6] CSI Analysis based on SBI Pension fund portfolio (May 2025)

5.2 Insurance companies

Like pension funds, insurance companies' liability profile and investment patterns closely match those of pension funds, making them suitable for funding the green transition.

Alignment

The regulatory department has proposed that large institutional investors, including LIC, allocate at least 1% of AUM to green bonds (Reuters, 2023). While modest in percentage terms, **LIC's size makes this potentially transformative**, mobilising tens of thousands of crores annually for climate infrastructure. Insurance companies are well-suited to finance mature climate solutions such as renewable energy, transmission infrastructure, and large-scale sustainable housing, due to the following characteristics:

- 2–40-year liability horizons (most are 10+ years), aligning with green projects' capital requirements
- Predictable cash flows, enabling long-term commitments
- Scale and growth, which allows participation in utility-scale renewable and infrastructure projects

5.3 Mutual Funds

Mutual funds are emerging as **India's most promising institutional channel for climate finance, due to their scale, equity orientation, and flexibility.** While pension and insurance funds are bound by conservative mandates, mutual funds can intermediate household savings into renewable energy, clean technology, and sustainable infrastructure sectors through a variety of asset classes. With stronger product innovation, deeper ESG fund penetration, and regulatory support for alternative access, mutual funds can anchor the next wave of India's green finance mobilisation.

Alignment

Green technologies are expected to grow rapidly in both the short and long term, making them attractive to equity investors. Additionally, unlike pension and insurance funds, mutual funds can take on higher risk, enabling them to invest in listed green technology companies at an early stage of their development.

Furthermore, FoF and multi-asset formats provide flexibility across infrastructure, commodities, and alternatives. This will allow mutual funds to invest in green technologies indirectly—for example, renewable energy and transmission lines are a part of the infrastructure sector.

ESG funds have a transition or transition-related investment category that enables them to invest in pure green (e.g., renewable energy) and transition technologies at the corporate level (e.g., hydrogen or industrial sector). The emergence of climate finance taxonomy can help in defining ESG funds, particularly the "transition or transition-related" investments category, thereby accelerating the process by providing greater clarity for raising green bonds and equity.

02 Robeco, Netherlands

Robeco, one of Europe's leading asset managers holding **EUR 337 billion** AUM, has made climate transition a core part of its investment approach. It exceeded its 2025 decarbonization target by achieving a 44% reduction relative to its 2020 baseline. Still, it notes that this improvement came largely from portfolio changes rather than from companies in the real economy actually cutting emissions. Robeco is maintaining its target of 50% decarbonization by 2030 while expanding its scope to around 60% and linking future progress more closely to real corporate emissions reduction. Through its stewardship programme, Robeco actively engages with companies that are moving too slowly on climate governance, emissions reduction and disclosure. Its broader view is clear—the global shift towards clean energy is not only an environmental need, but also a major long-term investment opportunity.

Green technologies vary significantly in their capital requirements, risk profiles, and financing needs, depending on their stage of maturity and cash flow structure. Mature technologies such as solar and wind can access capital markets directly through listed equity, corporate bonds, and InvITs, supported by stable, contracted cash flows. In contrast, early-stage technologies such as green hydrogen and EV manufacturing carry higher technology, execution, and policy risks, making them better suited to private equity and private debt structures channelled through AIFs. As these technologies mature and cash flows stabilise, they can transition to mainstream capital market instruments, including InvITs and public bonds, thereby broadening the pool of institutional capital available to them. (Table 4)

Table 4. Suitability of Institutional capital for various green assests

Technology	Characteristics	Institutional sources of finance	
		Current stage	Matured stage
Solar and wind energy	• Capital intensive • Long asset life with stable cash flows (PPAs)	**Maturity stage**	• Listed equity • Corporate/ green bonds • InvITs
Green hydrogen technology	• Very high CAPEX and R&D risk • Policy dependent	**Early-stage technology** • AIF private equity • AIF venture/ early-stage debt	• Listed / public equity • Corporate bonds, including sustainability- linked, transition, and green bonds
Energy storage (BESS)	• Capital intensive • Grid support revenues • Moderate tech risk	**Early commercial stage** • AIF private credit / senior debt	• Corporate bonds • Public equity • InvIT / Securitisation
EV purchases	• Higher upfront cost • Lower operating cost • Medium term asset life • Credit driven	**Scaling stage** • Asset backed Securities (ABS) through special purpose vehicle (SPV) • Loan securitisation pools	• ABS green auto, EV fleet/ mobility • Sustainability-linked bonds (OEM level)
Green buildings	• Capital intensive • Long asset life	**Scaling stage** • REITs • AIF real estate private equity	• REITs • Sustainability-linked bonds • Green mortgage-backed securities (MBS)
EV/solar/wind manufacturing	• High R&D needs • High uncertainty and commercial risk	**Very early-stage technology** • AIF private equity / credit	• Public equity • Corporate/ green bonds
Industrial decarbonization	• Capital intensive • Long payback	**Deployment / adoption stage** • AIF private equity	• Green bonds • Sustainability-linked and transition bonds • Listed / public equity

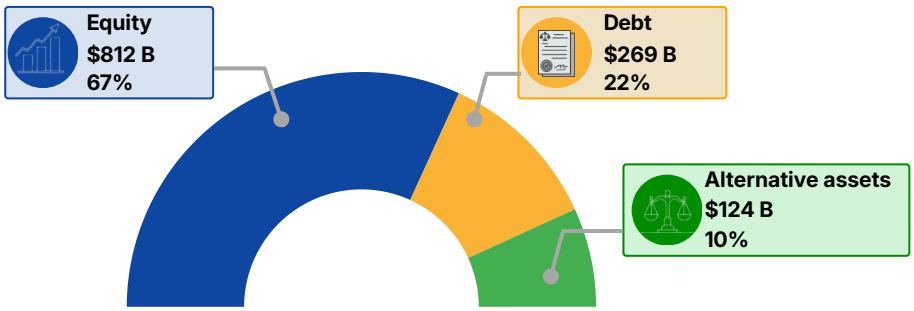
Note: Some instruments, such as EV fleet ABS and, specifically, "green" auto ABS or MBS, are in the pipeline or aspirational in India and are not yet established instruments.

Source: CSI analysis

6. Pathways for mobilising capital from institutional investors

Institutional investors can participate in the green transition through three broad asset classes: equity, bonds, and alternative assets. Equity investments, though largely concentrated in secondary markets, enhance market liquidity and enable capital recycling into new green projects. Bond allocations remain dominated by government securities, limiting flows to corporate and green debt, though this is expected to improve gradually over time. Meanwhile, alternative assets such as securitizations, InvITs, and AIFs provide innovative financing channels well suited to the diverse capital needs of green projects, yet current allocations remain well below regulatory limits. Collectively, institutional investors are projected to deploy approximately USD 1.2 trillion, meeting around 15% of India's cumulative green financing requirements through 2050 (Figure 9).

Figure 9. Flow of institutional capital into green assets (2026–2050)



Source: CSI analysis

6.1 Equity

Public equity is projected to remain the dominant instrument for raising capital from institutional investors for the green transition, reflecting institutional investors' higher equity exposure relative to corporate debt. This instrument alone is estimated to account for **USD 812 billion** or **approximately 67%** of total projected institutional green finance flows between 2026 and 2050. The industrial sector accounts for the largest share at USD 336 billion, given its greater exposure to equity investors, followed by the transportation sector at USD 275 billion, driven by the shift from ICE to EVs and hydrogen platforms. Power, despite having the largest financing needs, draws the least equity at USD 201 billion, as institutional investors' equity exposure is lower than in the other two sectors due to low profitability and limited capital appreciation.

Equity investment by Indian institutional investors (excluding mutual funds) is largely concentrated in **large-cap stocks** and **secondary markets**.

Equity investment style across institutional investors

Most institutional investors are either benchmark-oriented or follow conservative, buy-and-hold strategies with a strong bias towards large-cap, listed equities. This limits their participation in small and emerging green and transition-sector firms (e.g., energy storage, battery chemicals, green hydrogen, or EV supply chains). These firms can raise equity capital from private equity and venture capital during their growth phase. However, as they scale and achieve public listing, they become eligible for institutional capital through primary issuances (IPOs) and secondary market investments.[7]

Institutional equity investments are predominantly **secondary-market purchases**, which do not directly generate new capital for companies. However, they do improve market liquidity and enable existing investors to recycle capital, indirectly supporting fresh investment.

[7] The primary market is where securities are issued and sold for the first time—such as Initial Public Offerings (IPOs), Follow-On Public Offers (FPOs), and Qualified Institutional Placements (QIPs)—leading to capital formation. Secondary markets involve trading existing securities, thereby improving liquidity.

6.2 Bonds

Debt remains the dominant asset class for Indian institutional investors, with ~73%[8] of portfolios (excluding mutual funds) allocated to fixed income (mostly government securities), driven by regulatory norms and liability-matching needs. According to our estimate, bonds account for USD 269 billion, or approximately 22% of the total projected institutional green finance flows between 2026 and 2050—their distribution across sectors clearly reflects how cash flow certainty drives instrument choice. The power sector is estimated to mobilise USD 137 billion, over half of the total green debt, as PPA-backed contracted revenues provide predictable, long-tenor cash flows that debt markets require. Industry follows at USD 128 billion, as maturing technologies and clearer transition pathways gradually enable greater use of debt. In contrast, transport sees minimal debt deployment at just USD 3 billion, as transaction sizes for EV sales and related assets are small, making it less suited to conventional bond issuances.

01 Tenor mismatch: Correct misalignments

Commercial banks are generally better suited to short- and medium-term lending and cannot be heavily exposed to long-term lending because their liability duration is short, whereas NBFCs can offer long-term loans. Green projects, however, often require long-term financing to match their operating life, creating an asset-liability mismatch for commercial banks. Companies that raise capital from banks through medium-term loans must refinance them later, which introduces refinancing risk. Long-term bonds can help bridge this mismatch by providing patient capital from institutional investors with longer investment horizons, better suited to their liability profiles and financing requirements of green projects.

The key challenge is the allocation of debt capital—about 68–81%[9] of the debt exposure is concentrated in government and quasi-sovereign securities, limiting flows to corporate and green bonds. The corporate bond market is also skewed, with financial institutions accounting for ~75% [10] of issuances, leaving limited access for green and project-linked financing.

[8] CSI calculations; this is for EPFO, PFRDA, and insurance companies and excludes mutual funds due to data limitation.
[9] CSI calculations.
[10] CSI calculations, taking PFRDA as benchmark.

02 Green, Social, Sustainability, and Sustainability-Linked Bonds

In India, the cumulative issuance of Green, Social, Sustainability, and Sustainability-Linked (GSSS) bonds reached approximately USD 48 billion by 2024, of which USD 34 billion was for green bonds (International Monetary Fund, 2026). In 2024, new non-sovereign green bond issuances in India amounted to roughly USD 9.1 billion, representing about 7.3% of the total corporate bond issuance (USD 124.8 billion) (Reuters, 2024). The share of green bonds in corporate debt issuance could rise to 8–10% in the coming years (The Economic Times EnergyWorld, 2023). All GSSS bonds are issued at the refinancing stage, but will also serve as a key financial instrument for raising debt capital from institutional investors. However, there is a lingering question on the 'green bond premium', leaving limited incentives for investors and issuers of green bonds.

In the near term, green sectors can access higher levels of debt indirectly through financial companies, particularly NBFCs; these financial companies can raise capital in bond markets and channel it into green projects. The proposed National Green Financial Institution could play a catalytic role in this intermediation. In the longer term, deeper bond market reforms will be required to enable direct capital access for green and transition assets. Additionally, better use of risk management solutions for fixed-income securities can enhance the attractiveness of green-sector bonds to institutional investors (as discussed in Section 8 Risk mitigation instruments).

6.3 Alternative Assets

According to our estimate, alternative assets account for USD 124 billion, or approximately 10% of total projected institutional green flows between 2026 and 2050 and are the fastest-growing instrument class. This category includes instruments such as securitisation, InvITs, and AIFs, which enable institutional participation in assets outside traditional equity and debt markets. Despite regulatory limits of up to ~5% for pension funds and even greater flexibility for insurers and mutual funds, actual allocations remain very low, leaving significant headroom for capital allocation to green assets across these asset classes. The power sector attracts the largest share at USD 63 billion using InvITs, followed by transport at USD 48 billion, while industries remain limited at USD 12 billion.

"There is a need to move green projects into an investable security that match risk / return objectives of institutional investors. Infrastructure Investment Trust (InvITs) and securitisation turn illiquid assets into tradable instruments that fit institutional portfolios."

6.4 Securitisation

Securitisation involves pooling loans and issuing asset-backed securities (ABS) to investors. It offers a credible pathway to scale green projects by linking bank-originated green loans with long-term institutional capital. While well-established in India for housing finance and microfinance, its application to green assets is absent.

Under this structure, banks or NBFCs can originate green loans and transfer them to a special purpose vehicle (SPV) set up by a sponsor; the SPV issues rated fixed-income securities to institutional investors such as insurers and pension funds. This enables lenders to recycle capital, while providing institutional investors with exposure to predictable, cash-flow-backed green assets aligned with their investment mandates.

Securitisation also serves as an effective take-out financing mechanism. Projects can transition from bank balance sheets to capital markets once cash flows stabilise, reducing refinancing risk and freeing up bank capital for new lending. The Climate Bonds Initiative reports that securitising green loans could greatly expand the investor base in India. Globally, approximately 22% of green bond issuances in 2017 were in ABS form (Climate Bonds Initiative, 2025). In India, creating a "warehouse" of EV loans and Renewable Energy loans can allow domestic insurance companies and pension funds to invest in these securities.

In short, securitisation can repackage illiquid green investments into liquid securities. It aligns well with institutional preferences (rated bonds, predictable cash flows). Securitisation offers multiple benefits: risk diversification, improved access to finance, balance sheet optimisation for lenders, and potentially better financing terms, including a lower cost of capital and higher leverage.

6.5 InvITs

Infrastructure Investment Trusts (InvITs) are regulated vehicles that allow sponsors, typically infrastructure developers, to pool income-generating assets and raise capital from investors. Regulators can create guidelines for Green InvITs, a subset of InvITs, that focuses on climate-aligned or environmentally sustainable infrastructure, such as renewable energy, transmission, green buildings, and related grid assets. These trusts can pool capital from investors to acquire, own, and operate revenue-generating green infrastructure projects.

India's overall InvIT market had a total AUM of USD 73.3 billion in FY25 and is projected to rise 3.5 times to nearly USD 258 billion by 2030 (The Economic Times, 2026). Currently, there is no separate classification as Green InvIT, but a few InvITs have emerged which invest in the renewable sector.

- Sustainable Energy Infra Trust (SEIT), launched in 2024, is India's largest renewable energy InvIT, with INR 69 billion in AUM and 1.54 GWp+ of solar assets (SE Investments Limited, 2026).
- Virescent Renewable Energy Trust (VRET), acquired by IndiGrid for an enterprise value of INR 40 billion, exemplifies the sector's consolidation on renewable energy assets.
- Anzen India Energy Yield Plus Trust, with an AUM of INR 40.3 billion, invests in a diversified portfolio of energy assets, including transmission lines and renewable power assets.

Green InvITs are well-suited for pension funds and insurance funds because they offer long-term stable returns. Operational renewable energy assets (such as solar and wind) with long-term PPAs, transmission infrastructure (e.g., renewable evacuation or green energy corridors), and grid assets offer predictable cash flows. As more of these assets become operational, InvITs enable institutional investors to gain exposure without the development risk. Emerging technologies such as battery storage, EV charging infrastructure, and, eventually, green hydrogen assets hold promise for inclusion in Green InvIT portfolios—though many are still at pre-commercial or early stages.

Real Estate Investment Trust (REIT), while similar in structure to InvITs, focus specifically on income-generating real estate assets. They can be used to package energy-efficient commercial buildings (e.g. green buildings) and retail spaces into tradable securities, offering institutional investors access to stable, rental-backed cash flows with lower development risk. Nexus Select Trust raised about INR 7 billion, and Mindspace Business Parks REIT raised INR 6.5 billion through sustainability-linked bonds, with International Finance Corporation (IFC) as an anchor investor. These instruments tie borrowing costs to environmental performance, including targets such as reducing GHG emissions, improving energy efficiency, and increasing the amount of green-certified space. For institutional investors, this offers exposure to sustainable property with steady rental cash flows and lower development risks.

To invest in these investment trusts, there is a cap of 3% for pension funds and 5% for insurers of their total corpus, though even this headroom remains unused. Given the low-risk, stable-return profile of Green InvITs and REITs, and their strong alignment with institutional investment mandates, increased focus on this asset class could significantly scale up domestic institutional finance for green assets.

As these structural and policy enablers evolve, Green InvITs can emerge as a strategic financing channel, enabling developers to recycle capital while providing institutions with ESG-aligned, income-generating investment opportunities, bridging the gap between sustainability goals and long-term finance.

6.6 Alternative Investment Funds

Alternative investment funds (AIFs) are SEBI-regulated pooled vehicles that can invest beyond traditional equities and bonds, making them suitable for green projects that need flexible capital structures. Category I and Category II AIFs[11] are closed-ended funds with a minimum tenure of three years and a minimum investment threshold of INR 1 crore (Groww, 2024), thereby ensuring participation by qualified investors and enabling portfolio diversification across multiple strategies and vintage years. These categories can potentially attract capital from institutional investors such as pension funds, insurers, and mutual funds and are well-suited to renewable and emerging climate technologies.

Category I AIFs are designed for startups and early growth businesses, where return expectations can be relatively high (approximately 15–25% p.a.) but are accompanied by higher risk, illiquidity, and volatility. **Category II AIFs** are generally more suitable for mid- to late-stage projects and private equity-style strategies, where cash-flow visibility is stronger and expected returns are relatively more stable, typically ranging 14–20% p.a. for private equity strategies and 11–16% p.a. for private credit (Equirus Wealth, 2026). In climate finance, this makes Category I better suited to early-stage technologies that need patient capital; Category II fits renewable energy, storage, and industrial transition assets that are closer to operational stability. SEBI could consider introducing a green-labelling framework within existing AIF categories and, over time, develop a dedicated "Green" AIF category focused on green technologies and investments, aligned with the climate finance taxonomy being developed by the Ministry of Finance.

[11] Category III AIF are more trading oriented and not suitable for transition investments.

6.7 Fiduciary duty of institutional investors

Institutional investors and governments cannot simply hope the world will stay within 1.5°C. They need to align portfolios with a credible net-zero pathway and use their influence to reduce climate risk and finance the transition. For large, diversified investors, most of their returns are driven by the overall health of the financial system and the real economy, which in turn depend on stable environmental and social systems. Climate change is therefore a systemic financial risk, not only an external ethical concern.

A useful way to frame their role is to distinguish between “playing defence” and “playing offence”. On the defensive side, investors need to manage physical and transition risks in their portfolios, for example, by assessing climate exposure, adjusting sector weights, engaging with companies on risk management, and, in some cases, reducing exposure to high-risk, high-emitting assets. On the offensive side, they should actively allocate capital to climate solutions such as renewable energy, efficiency, clean transport, and adaptation infrastructure, and support policies and innovation that lower the cost of decarbonisation. This is not philanthropy. Long-term investors increasingly view responding to climate change as part of their fiduciary duty to protect beneficiaries from systemic risks and to capture long-term opportunities.

For insurance companies, climate risk is core business. Physical climate risks, such as heat, storms, and floods, directly affect claims experience and balance sheets. By re-pricing, excluding, or reinsuring these risks, insurers already act as a buffer between households and climate shocks, and they can further contribute by developing products that support resilience and low-carbon investment.

Pension funds and mutual funds manage the long-term savings of workers and households. Their equity investments often remain invested over very long time horizons (Jena et al., 2018), so they cannot diversify away from systemic climate risk that affects the broader economy and financial markets. Leading funds now explicitly link climate action to their fiduciary responsibility, arguing that helping to shape sustainable economies, communities, and capital markets is part of being a prudent long-term investor.

This involves three linked tasks: managing climate risk, aligning portfolios with net zero pathways, and contributing to real-world decarbonisation through capital allocation and stewardship.

In this sense, institutional investment in green projects is not just about buying assets. It is an exercise in shaping market outcomes, reducing systemic risk and supporting a transition that is essential for the long-term financial interests of the people whose money they manage.

03 La Caisse, Canada

Canadian pension funds are increasingly treating climate transition as part of long-term value creation, fiduciary responsibility, and sound risk management. La Caisse, with assets of about **CAD 496 billion**, has already exceeded its climate targets. It reported a nearly 50% reduction in the portfolio's carbon footprint, while global emissions rose over the same period. It has set a target to reduce portfolio carbon intensity by 60% from 2017 levels by 2030 and has invested **CAD 226 billion** in climate action by CY 2025, with a target of **USD 400 billion** by 2030. Their strategy combines support for companies that are setting decarbonization targets with direct investment in climate solutions, including low-carbon assets, nature-based solutions, adaptation and resilience, and climate enablers (La Caisse, 2025).

7. Barriers and solutions to mobilise institutional capital

There are several institutional, structural, and regulatory barriers and risks to the flow of institutional capital to green sectors. These barriers and risks vary by the asset classes to which they are exposed. As shown in Table 4, institutional investors participate in green technologies across different asset classes; however, the way risks are transmitted to these asset classes varies.

While some obstacles are structural and institutional, others stem from policies and regulations. Structural and institutional obstacles are related to conventional investment and financing practices, institutional mechanisms and capacity, and financial products and services. Financial policy and regulatory barriers are related to rules and regulations. This section outlines the institutional, policy, and regulatory barriers for institutional investors arising from the existing landscape.

Risks vary significantly across technologies and project structures. Capital-intensive infrastructure assets face different dominant risks at different stages of the project lifecycle, and mitigation requirements differ accordingly. There are also significant perception risks associated with green sectors, which act as a major stumbling block to green investments. Moreover, there is a limited universe of investible companies with strong disclosure standards, transparent reporting, and credible corporate governance (SEBI, 2023). The dearth of governance-ready green-sector firms elevates due-diligence costs. It heightens perceived risks, discouraging institutional investors bound by fiduciary and stewardship requirements from pursuing sustainability objectives at the expense of risk-adjusted returns, unless there is a clear client mandate (Organisation for Economic Co-operation and Development [OECD], 2025a). Without improvements in transparency, data quality, and governance practices (Della Croce et al., 2013), even risk-aligned institutional investors struggle to deploy capital at scale despite strong long-term fundamentals in green sectors. Table 5 summarises the key risks relevant to climate investments in India, the types of projects most affected, and commonly used mitigation instruments.

Table 5. Key barriers and risks to green assets

Name of Risk	Description	Type of technologies and projects
Credit/ default risk	The issuer defaults on scheduled debt-service or payment obligations.	All capital-intensive projects (utility-scale renewables, transmission, InvIT assets, large storage, distributed solar in housing and commercial buildings, and open access renewable energy projects). For example, the poor financial health of DISCOMs creates credit risk for renewable generating companies[(a)], thereby affecting the credit ratings of their bonds.
Policy/ regulatory risk	Adverse changes in laws, regulations, tariffs, taxes, or weak enforcement of existing policies, including delays in approvals and contract implementation.	Grid-connected renewables, regulated infrastructure, and projects dependent on state utilities or policy-backed revenue mechanisms. Any tariff adjustment can hamper their profitability[(b)]. Similarly, any changes in import duty on solar equipment will disrupt the economics of renewable projects.
Off-taker/ counterparty risk	Buyer or contractual counterparty fails to honour contracted volume or payment obligations due to financial stress, delays, or default.	Renewable energy PPA with financially weak DISCOMS and corporate PPAs with weaker counterparty cause counterparty risks[(c)]. Similarly, green hydrogen projects without a long-term off-taker creates financial risk for financiers.
Technology/ performance risk	Technology underperforms relative to expected output due to design flaws, degradation, or operational inefficiencies.	Emerging technologies such as BESS, green hydrogen, offshore wind, and advanced inverters.
Merchant/market price risk	Fluctuating market prices without long-term contracted revenues, leading to volatile cash flows[(d)].	Merchant renewable projects, open-access projects, energy storage arbitrage, and trading-oriented assets.
Construction risk	Delays, cost overruns, or damage during the construction phase affecting project viability and timelines[(e)].	Greenfield infrastructure, large-scale renewables, transmission, and offshore and climate-resilient infrastructure.
Carbon pricing	Lack of meaningful carbon pricing does not incentivise companies to invest in low-carbon technologies[(f)].	All companies are investing in low-carbon technologies, either as buyers or developers of technologies.

Source: CSI analysis; [(a)]Kumar & Chawla, 2020. [(b)]AZB & Partners, 2022. [(c)]Shrimali, 2021. [(d)](Pavlík et al., 2025). [(e)](International Finance Corporation, 2025; Hendrata et al., 2025). [(f)]World Resources Institute India, 2026.

Structural and institutional barriers

India lacks a deep secondary market for bonds, including those issued by green companies. Illiquidity remains a key constraint on capital deployment, as it limits mark-to-market valuation, duration management, and exit options for institutional investors. In addition, stringent credit-rating requirements (AA minimum for debt, often a preference for only AAA) restrict capital flows to several green companies and projects. Regulatory caps on asset classes (e.g., 5% for alternatives in NPS; 15% for equities in EPFO) constrain capital flows. As capital availability is restricted across asset classes, it is also limited in green sectors. In addition, small green projects (such as distributed solar or charging stations) do not attract these investors unless they are converted into tradable instruments. Besides, pension funds do not have a direct climate mandate in portfolio allocation. There are additional barriers to investment in green sectors, including a short-term focus, a lack of track record for climate-oriented financial products, and an awareness gap. Excessive focus on short-term returns prevents them from investing in a climate-focused, theme-based investment that could generate long-term returns and make the funds climate-resilient.

For institutional investors, governance is a big aspect, where all green investments must be weighed against a governance scale. In green, social, and sustainability-linked bonds, concerns around greenwashing, weak sustainability-linked covenants, inconsistent disclosures, and limited post-issuance monitoring can reduce investor confidence, constraining broader institutional participation in INR-denominated sustainable/green bond issuances. Even equity investments are often avoided in markets with weak governance standards. The ESG mutual fund AUM is still <1% of total sectoral AUM and is not growing due to a lack of investor education on sustainability and climate disclosure, as well as underperformance by a few ESG funds. There is limited awareness among retail investors about climate risk-return dynamics.

Not all risks affect asset classes equally. Within a strategic asset allocation framework, each asset class has a distinct risk–return profile shaped by how cash flows are generated, their stability and visibility, and the level of leverage and contractual protection. In equities, risks are reflected in earnings and valuation; in debt, in credit quality, spreads, and default risk; and in structured or pooled instruments, in the performance of the underlying asset pool.

> **Green projects often remain too small, too new, or too risky for current mandates. This is why credit enhancement, guarantees, partial risk support, blended finance, and structured vehicles matter.**

8. Risk mitigation instruments: Roles, gaps and scalability

This chapter outlines targeted recommendations to address key challenges. It proposes measures to mitigate the risks associated with financial assets held by institutional investors. Given the inherently risk-averse nature of these investors—particularly pension funds and insurance companies—it is essential to reduce risk to levels that enable their participation in green financial assets while ensuring these instruments offer competitive risk–return profiles. The chapter also recommends specific incentive mechanisms to increase the appeal of green financial assets to institutional investors.

> **Risk-mitigating instruments such as guarantees, loan loss reserves, and blended finance can make green assets investible for institutional investors.**

Risk mitigation instruments limit losses and stabilise returns for private financiers. These instruments lower perceived and actual investment risks and mobilise private capital. Various instruments can mitigate the risks discussed in this report, and the ability to do so will be a key factor in determining financing flows from institutional investors to the green sector. However, each of these risk-mitigation instruments has several shortcomings. Hence, it is crucial to overcome these shortcomings through public interventions. These are outlined below.

8.1 Guarantees

A guarantee is a contractual undertaking by a third party (the guarantor or surety) who agrees to assume responsibility for a debt or obligation of another (the principal debtor) if that debtor defaults (Merriam-Webster, 2026). By reallocating risk from private investors to a guarantor with a stronger credit standing, guarantees improve the credit profile of climate projects and enable access to longer-tenor, lower-cost capital.

Partial credit guarantees

A **partial credit guarantee (PCG)** is a credit enhancement mechanism for debt instruments in which a guarantor commits to cover a specified portion of principal and/or interest in the event of non-payment by the borrower, regardless of the reason for the default. It improves the credit profile and potentially enables longer-tenor financing.

PCGs are typically provided by multilateral development banks (MDBs), development finance institutions (DFIs), and domestic public-sector finance institutions such as the Indian Renewable Energy Development Agency (IREDA) and India Infrastructure Finance Company Limited (IIFCL), with some support from specialised guarantee providers. India has PCG instruments targeted at infrastructure, including climate-aligned assets. In 2025, KPI Green Energy issued an INR 670 crore green bond with a 65% guarantee from GuarantCo, which enabled an AA+ (CE) rating from domestic rating agencies and broadened institutional investor participation (GuarantCo, 2025). IREDA offers a guarantee of up to 25% of the bond size for operational wind and solar projects seeking to raise bonds (International Institute for Sustainable Development, 2026).

Partial risk guarantees

A **partial risk guarantee (PRG)** protects private lenders against debt-service defaults arising from government or public-entity non-performance, while excluding commercial or performance-related defaults (Asian Development Bank, 2026). Unlike PCGs, which cover general credit default, PRGs target specific political and contractual risks such as sovereign or sub-sovereign entity failure to meet payment obligations (like a state-owned DISCOM), breach of contract, adverse change in law, expropriation, and currency inconvertibility or transfer restrictions (Global Facility for Disaster Reduction and Recovery, 2015).

PRGs are mainly provided by multilateral development banks such as the World Bank Group and ADB, specialised guarantee facilities, DFIs such as India's Partial Risk Sharing Facility (PRSF) via the Small Industries Development Bank of India (SIDBI), export credit agencies, and emerging domestic guarantee funds. For instance, in India, PRGs are vital for shielding investors from the poor financial health of State Electricity Distribution Companies (DISCOMS).

Guarantees are among the most effective tools for mobilising private capital for climate investments in emerging markets. A recent OECD evaluation found that guarantees leveraged 23% of all mobilised private finance between 2020 and 2023 (OECD, 2025b). Guarantee facilities have shown potential to mobilise 6–25 times more financing than direct loans, because they reduce risk and attract more investors (Climate Policy Initiative, 2025).

Gaps and challenges

- **High eligibility thresholds:** Guarantee schemes often impose conditions such as minimum bond size, minimum debt service coverage ratio (DSCR), standalone credit quality requirements, and a demonstrated operational track record. Under IREDA's Credit Enhancement Guarantee Scheme, the eligibility criteria include: a minimum issue size of INR 100 crore, a DSCR greater than 1.2, a debt-equity ratio up to 3:1, and at least one year of operational history post-COD. These thresholds exclude many small-scale, distributed, or early-stage climate projects.
- **Complex and time-consuming processes:** Guarantee applications require extensive due diligence, multiple approvals and negotiations with guarantors, lenders, and rating agencies. The complexity and longer transaction timelines can discourage borrowers from pursuing PCG solutions.
- **High guarantee fees and transaction costs:** Guarantee fees of 1.8–2.9% per annum of exposure, combined with the costs of structuring, rating, and legal documentation, can materially compress investor yields or raise issuer costs. This can reduce the attractiveness of PCGs, particularly for smaller or lower-margin issuances.

8.2 Loan loss reserves

A loan loss reserve (LLR) is similar to guarantees, but with an LLR, a dedicated pool of capital is set aside to absorb initial credit losses in a loan portfolio. This reserve serves as a first-loss buffer that protects senior tranches in the event of borrower defaults. By reducing expected losses and improving portfolio credit quality, LLRs make lending to riskier or less established climate sectors more viable for commercial and institutional capital providers. LLRs are commonly used when project or borrower-level default risk is difficult to assess, such as in distributed renewable energy, energy efficiency, and newer climate technologies that lack performance history.

LLRs are typically provided by governments, DFIs, climate funds, or green banks. In India, examples include the PRSF, implemented with SIDBI, which uses a reserve to guarantee a portion of lenders' exposure to ESCO projects. This approach has enabled commercial lending in segments where collateral quality is weak, and credit perceptions are high risk.

Gaps and challenges

- **Capital intensive:** Unlike a guarantee, which is a promise to pay, LLRs require an upfront pool of capital that must be fully funded before lending begins. This limits scalability and increases the overall cost of financing for the issuer.

- **Moral hazard risk:** Because downside risk is partially covered, borrowers or lenders might take on riskier projects than warranted or reduce diligence, potentially increasing the probability of default (Frisari et al., 2013).

- **Difficulty in estimating default probability and sizing reserves:** The benefit of LLRs depends on accurate risk assessment across the portfolio. In sectors such as green with limited historical data, estimation is difficult. Mis-sizing is a real danger, as under-allocation may leave lenders unprotected, and over-allocation may tie up too much concessional capital and raise financing costs, making the instrument inefficient.

Given the numerous gaps and challenges, dedicated work is needed to assess these shortcomings and develop practical solutions to enhance the effectiveness of credit enhancement in fixed-income securities.

8.3 Blended finance

Blended finance refers to the strategic use of concessional capital from public or philanthropic sources to mobilise greater volumes of commercial finance into climate-aligned investments that would otherwise be considered too risky or unviable. Concessional instruments can take several forms, including first-loss equity, subordinated debt, guarantees, technical assistance grants, or interest rate buy-downs. By improving the risk-return profile of green investments, blended finance enables institutional investors to participate in sectors and technologies where risks are higher or returns are initially uncertain.

Globally, blended facilities have been widely deployed by MDBs, DFIs, climate funds such as the Green Climate Fund and the Climate Investment Funds, and private foundation-backed vehicles. In India, blended finance has supported distributed renewable energy, rooftop solar, electric mobility, energy efficiency and green Micro, Small and Medium Enterprises lending through initiatives by SIDBI, NIIF, IREDA and international DFIs.

Gaps and challenges

- **Limited availability of concessional capital:** Dependence on public budgets or philanthropic initiatives limits the scale of blended finance solutions relative to the overall investment requirements of the energy transition.
- **Risk of market distortion:** Poorly designed concessionality may displace private investment instead of catalysing it, especially if support is not gradually phased down.
- **Complex structuring and high transaction costs:** Blended finance projects often involve multiple stakeholders, approval processes and customised structures, increasing execution time and costs, which may deter investors and capital users.
- **Unclear exit pathways for concessional providers:** Without a plan for transitioning to purely commercial financing, markets may remain reliant on public support longer than intended.
- **Measurement of mobilisation impact:** Credibly assessing how much private capital is truly mobilised and whether risks are genuinely reduced remains a methodological challenge for policymakers and investors.

In light of the many gaps and challenges, a focused study and consultation are required to evaluate these issues and design practical solutions to enhance the effectiveness of blended finance in raising capital from institutional investors.

8.4 Insurance

A contract in which an individual or entity pays an insurance company in exchange for financial protection or reimbursement of losses resulting from a covered event (Investopedia, 2026). Insurance unlocks institutional capital by absorbing specific risks that financiers cannot price or accept, thereby enabling stable cash flow streams for long-term investment.

Performance insurance

Performance insurance works similarly to traditional forms, such as property and casualty insurance, by covering technology-related risks. It serves as a backstop against newer, innovative technologies failing to reach expected production levels during their commercial scale-up (WTW, 2025). Performance insurance can be used to protect a renewable or climate-infrastructure project against failure to meet expected operational or energy output performance.

Leading international reinsurers (such as Munich Re, Swiss Re, and Allianz) and specialist insurers (e.g., AXA XL and Marsh-facilitated facilities) offer solar and wind performance guarantees worldwide. In India, several general insurers (e.g., New India Assurance and AIG General Insurance) offer performance or output-linked insurance for solar power plants (Ministry of New and Renewable Energy, 2024). Specialist brokers and insurance consulting firms in India also market broader "renewable energy insurance packages" that cover construction, operations, machinery breakdown, and, in some cases, output or warranty-related risks (Anand Rathi Insurance Brokers Limited, 2026).

Risks addressed and relevance for institutional investors

- **Operational and technology underperformance risk:** If an asset or technology generates less power or operates below expected efficiency, it directly affects revenue and cash flows, making it more difficult to service debt. Insurance transfers part of this risk to an insurer, reducing the uncertainty institutional investors would otherwise face.

- **Support for new technologies:** Performance insurance encourages the adoption of solutions such as battery storage, hybrid systems, and advanced inverter technologies by reducing lenders' and investors' concern about equipment reliability and degradation risk.

- **Enhanced credit profile for capital-market instruments:** With performance risk insured, project revenues become more predictable. This can improve the credit ratings of green bonds, securitised portfolios, or InvIT units backed by renewable assets, making them suitable for pension funds and insurance investors with strict rating and stability requirements.

Gaps and challenges

- **Premium cost sensitivity:** Premiums can materially affect project returns in cost-

competitive sectors. Unless priced efficiently or supported through blended structures, sponsors may be reluctant to adopt performance cover.

- **Data and modelling limitations:** Accurate underwriting requires strong performance and resource datasets; a shortage of long-term asset operating data in India increases uncertainty and can restrict coverage or elevate pricing.
- **Limited product standardisation and scale:** Standalone performance insurance remains relatively nascent in India, and underwriting capacity for large exposures or innovative technologies may be constrained.

Table 6. Key risk mitigation instruments: Functions, risk coverage, and key challenges

Solution	What it does	Risks addressed	Key challenges
Partial credit guarantees	Enhances credit rating; enables bond market access	Credit risk; rating and refinancing risk	High cost; strict eligibility; complex structuring
Partial risk guarantees	Covers government/payment risks; supports infrastructure financing	Off-taker; contractual; policy/regulatory risk	Limited scope; excludes commercial risks
Loan loss reserves	First-loss buffer; enables lending to new sectors	Default; early-stage; portfolio risk	Capital intensive; sizing and moral hazard risk
Blended finance	Concessional capital improves risk-return; crowds in private investors	Credit; technology; market risk	Limited scale; high complexity; unclear exit pathways
Performance insurance	Covers output/performance shortfalls; stabilises cash flows	Technology; operational; performance risk	Premium cost; data gaps; limited standardisation

Source: CSI analysis

8.5 Feasibility and scalability of risk mitigation instruments

Risk mitigation instruments are central to unlocking institutional capital for green and transition assets by reducing perceived risks, improving bankability, and expanding investor participation. However, each instrument addresses different types of risks across technologies, asset classes, financing structures, and project stages, resulting in varying levels of market relevance and applicability. We have assessed key risk mitigation instruments across two dimensions: (a) feasibility; (b) effectiveness and scalability (see Table 7). While the former assesses the practical and regulatory readiness for implementation in India, the latter examines the instrument's effectiveness in reducing financing risk and mobilising capital at scale.

Table 7. Risk mitigation instruments, their feasibility; effectiveness and scalability

Risk mitigation instruments	Feasibility	Effectiveness and scalability
Partial credit guarantees	**High.** PCGs already exist in India; further public interventions include higher concessional finance to reduce the cost of guarantee and technical assistance to reduce transaction and monitoring costs.	**High.** PCGs directly reduce debt-service default risk and can enhance credit ratings, which is essential to attract private investors. PCGs can also be applied in multiple asset classes, including corporate bonds and securitisation.
Partial risk guarantees	**Moderate.** PRGs are harder to structure than PCGs, and there are the same challenges as PCGs. Furthermore, PRGs in India primarily cover credit risk, and no large PRGs have been introduced in India. They need the same public intervention as PCGs.	**High.** PRGs are highly effective as they cover risks associated at various levels and ultimately lead to lower financial risk. Scalability depends on the type of PRGs and the risks they mitigate. The scalability is constrained by the availability of concessional capital.
Loan loss reserves	**Moderate.** LLRs are simpler to execute than guarantees as they do not require bilateral guarantee agreement or a rated guarantor counterparty, reducing transaction complexity. However, they require upfront concessional capital, robust portfolio monitoring and loss attribution mechanisms, which limit the ease of deployment.	**Moderate.** LLRs are effective for pooled portfolios of smaller or riskier green loans where project-level guarantees are uneconomical. However, unlike PCGs, they do not provide direct rating uplift, limiting access to bond markets and regulated investment pools. In India, effectiveness is further constrained by the lack of standardised green loan performance data, making it difficult for lenders and guarantors to accurately assess and price residual portfolio risk. The scalability is constrained by the availability of concessional capital. In addition, LLR requires more upfront capital than PCG, which limits the instrument's scalability.
Blended finance	**Moderate.** India already has the market infrastructure for blended structures through NIIF, DFIs, SEBI AIFs, and existing public funding models such as VGF. However, there is a need for a separate legal structure for blended finance.	**High.** Blended finance is among the most effective and highly scalable mechanisms for capital mobilisation. It can be tailored to the specific viability gap, de-risk projects, and crowd in private capital across stages, technologies, and instruments.
Performance Insurance	**High.** Performance insurance can be underwritten within standard insurance contracts, and some products already exist in India. The main constraints are limited actuarial data, specialist underwriters, and narrower product depth.	**Moderate.** It is effective for technology and yield risk, especially in mature renewables where output data are stronger. Its coverage is narrower and less useful where credit, policy, or off-taker risk dominates.

Source: CSI analysis

Scaling risk mitigation instruments require action across four interconnected dimensions.

Simplification and standardisation are the most immediate priorities. Tiered eligibility thresholds, standardised term sheets, and templated documentation for guarantees, insurance products and blended finance vehicles would significantly reduce transaction costs and processing timelines. This would make instruments accessible to smaller projects and reduce the complexity of structuring for borrowers and investors.

Regulatory enablement is foundational. India currently lacks comprehensive regulatory frameworks for issuing credit guarantees, using blended finance vehicles, and selling performance-based insurance products. A unified regulatory framework, coordinated across RBI, SEBI, IRDAI, and PFRDA, would reduce the legal ambiguity that currently deters both domestic providers and institutional investors.

Establishing a **National Green Guarantee Corporation (NGGC)** could create a unified guarantee platform for green assets, backed by capital from the Government of India and MDBs. This would accelerate execution, lower transaction costs, and improve market confidence. A similar company—Green Guarantee Company—based in the UK, specialises in providing guarantees for climate-related projects and assists them in accessing long-term capital-market funding. In India, an NGGC could play a similar bridging role, enhancing the credit profiles of green companies and enabling them to raise long-term debt capital at a reasonable cost.

Institutional capacity and data infrastructure must also be strengthened. Centralised performance databases for green assets, standardised credit models for emerging green sectors, and transparent reporting frameworks can reduce information asymmetry and improve underwriting confidence.

Finally, **capital efficiency and leverage** must improve. Instruments such as loan loss reserves and blended finance facilities should be redesigned with explicit leverage targets and defined concessional exit pathways to ensure public capital catalyses private investment rather than substituting it.

Together, these reforms can transform risk mitigation from fragmented interventions into a scalable system capable of mobilising institutional capital for climate infrastructure.

> **Policy interventions and risk-mitigation solutions are central to unlocking institutional capital for green and transition assets by reducing perceived risks, improving bankability, and expanding investor participation.**

8.6 Incentives and mandates

Targeted incentives and calibrated mandates would help shift institutional portfolios from passive holdings of sovereign debt towards productive, climate-aligned investments without compromising financial stability.

One approach is to use fiscal incentives, such as tax relief on income from certified green investments. For example, interest income from green bonds and securitised green financial instruments could be granted preferential tax treatment, improving post-tax returns for institutional investors. Such incentives would directly enhance the relative attractiveness of green assets compared to conventional government securities.

Beyond green debt, tax incentives can also extend to climate-focused funds[12] by classifying them under a framework similar to the equity-linked savings scheme (ELSS), allowing investors to claim tax deductions while investing responsibly. Just as ELSS schemes helped build India's long-term equity culture by nudging household savings into productive capital, similar incentives for climate or sector-specific green funds would increase awareness, normalise sustainability-linked investing, and channel significantly higher equity inflows into the green transition. This would broaden participation beyond institutions, mobilise patient capital, and complement fiscal incentives to achieve the dual objectives of green financing and long-term equity investments.

The second approach can be a more structural lever, such as regulatory mandates. Regulators could require institutional investors to allocate a minimum percentage of their assets to green or transition-aligned investments, similar to priority sector lending norms in banking. Even a modest mandate such as 1–2% of incremental investments could unlock substantial capital, given the scale of institutional balance sheets.

To improve secondary-market liquidity for green bonds, SEBI could nudge primary dealers to engage in market-making for bonds issued by green companies and create dedicated green bond trading segments on the BSE and NSE with lower transaction costs and streamlined trading mechanisms.
Policy and regulatory interventions will be key to attracting institutional capital for green technologies. The feasibility of each policy and regulatory intervention is outlined in Table 8.

[12] SEBI's transition related category of ESG funds or new taxonomy can be developed for funds investing in green sectors.

Table 8. Feasibility and scalability of policy and regulatory interventions

Solutions	Feasibility	Scalability
Green asset securitisation	**High.** Since India is announcing a green taxonomy[(a)], the same principles can be applied to green asset securitisation. There is already a system for asset securitisation in India.	**High.** Securitisation of assets (such as auto loans and housing finance) in India, although not mature, has a decent track record. Green assets, such as EVs (3Ws and 4Ws) and green housing, are well-suited for securitisation[(b)].
Green InvITs and REITs	**High.** Existing legal and regulatory structures already support these vehicles, and the regulator can easily create a subset for green projects—for example, green bonds, a subset of any bond.	**High.** These two financial instruments are sizable and are still a growing asset class in India. Green assets, such as renewable energy, transmission lines, and green housing, are well-suited for green InvITs and REITs.
Green AIFs	**High.** The SEBI AIF framework is mature. Green AIFs can be launched with limited regulatory change.	**Moderate.** Given that this instrument primarily funds capital for riskier projects, AIF is moderately scalable for green assets.
Preferential tax treatment on green finance instruments	**Moderate.** Tax incentives can be introduced through Finance Act amendments or notifications from the Central Board of Direct Taxes . Since this measure entails a fiscal loss, its implementation is moderately feasible. However, the government is pushing for an energy transition for energy security purposes; there is a likelihood of implementation of this tax rule.	**Moderate.** Preferential tax treatment for a few years can mobilise a significant volume of capital for green assets. Once green assets are mainstream, this benefit can be withdrawn.
Minimum investment mandate in green assets	**Moderate.** Creating a new mandate may crowd out investment in other sectors. However, regulators have created an investment mandate for strategically important sectors, and the green sector is one of them.	**High.** A massive pool of capital from pension funds and insurance companies can be directed into green assets.

Source: CSI analysis; [(a)]Press Information Bureau, 2024 .[(b)]Climate Bonds Initiative, 2025

In addition, clear taxonomy and certification frameworks are essential to ensure credibility and avoid greenwashing. Green equity and transition equity principles and standards can be developed to attract capital for public equity. Combined with risk-mitigation tools such as guarantees or credit enhancement, these measures can align institutional investors' objectives with national climate goals.

The reorientation of Institutional capital requires regulatory and policy interventions, as well as financial market reforms

9. Way forward

Financial actors play a catalytic role in directing capital towards economic activities, aiding the achievement of net zero by determining how and where to allocate it. The acceleration and redirection of an unprecedented amount of capital towards these economic activities demand action from all stakeholders in the financial system, including banks, public financial institutions, institutional investors, financial policymakers, and regulators, to ensure this transition proceeds smoothly.

The existing investment and lending practices will not help them fully decarbonise their portfolio (and the economy), as they are mostly based on historical records, whereas climate change is both a current and a future issue. Institutional investors can redefine their investment strategies to meet net zero by updating their policy statements to align with net zero, demonstrating that commitment through appropriate disclosure, and redefining the fund managers' roles and mandates. The other steps are conducting strategic portfolio allocation to meet net-zero targets, reallocating the portfolio if it is not meeting the carbon-emission target, and advising clients on climate risk and opportunity.

At the same time, capital mobilisation must be guided by clear prioritisation across sectors and project maturity. Given fiduciary constraints, institutional capital is most effective in areas where technologies are mature, cash flows are secured, and risk-mitigation mechanisms can attract private finance, such as in grid-scale renewables, transmission, and select industrial transition pathways. Green financial market development must be sequenced carefully. In the near term, policy and financial regulators should focus on improving the liquidity, standardisation, and scale of existing investment instruments, as well as creating new instruments better suited to green investments. The next step will be to earmark them as specifically "green" and define and standardise them within a proper framework. Once this pipeline is in place, modest allocation mandates can be introduced for pension funds, insurers, and provident funds, linked to the availability of suitable instruments. Over time, as green assets gain scale and benchmark status, allocation can become increasingly market-driven.

As it becomes increasingly evident that climate change can threaten the financial system, financial regulators have a fiduciary duty to intervene to make the financial system resilient to this inevitable risk and to reorient capital flows towards green sector technologies. Traditional financial regulatory tools and guidelines are inadequate to achieve the desired outcome. Although the financial regulatory mechanisms remain to be uncovered, scholars and practitioners have shown that financial regulation can manage climate-related risks to the financial system. Financial regulation can not only make the financial system resilient to this imminent risk but also alter capital allocation in favour of green technologies.

Further research is needed to refine and recalibrate existing risk-mitigation instruments and to design innovative financial tools to effectively manage the evolving risks associated with the green finance. Such efforts should focus on enhancing the efficiency, scalability, and accessibility of these instruments to better align with the risk–return expectations of institutional investors. In addition, future studies should examine the suitability of blended finance structures, guarantees, and credit enhancement mechanisms in de-risking green assets across sectors. Strengthening the evidence base through empirical analysis and pilot interventions will be critical to ensure that these tools are both practical and responsive to market needs, thereby enabling greater capital mobilisation towards sustainable investments.

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Annexure 1: Methodology

Macroeconomic and Savings Projections

We have used projected macro-economic variables (e.g. GDP, Saving, financial savings) and financial intermediations from NITI Aayog reports – Macroeconomic Implications (Vol 2) & Financing Needs (Vol 9)

AUM Projection for Institutional Investors

1. Pension funds and EPFO

- **AUM projection basis:** AUM is projected using contributions, investment income, and benefit payments. Contributions are linked to the portion of household financial savings directed towards pension and provident funds.
- **Asset allocation:** Both pension funds and EPFO portfolios remain conservative and debt-oriented. Equity exposure remains relatively limited compared with mutual funds.
- **Returns, benefits, and expenses:** Investment returns are based on assumed long-term yields across debt and equity asset classes. Benefit payouts gradually increase over time due to ageing demographics, while operating expenses of institutional investors remain negligible.

2. Life Insurance and General Insurance

- **AUM projection basis:** AUM is projected as previous AUM plus premiums and investment income, minus benefits and expenses.
- **Mobilisation assumption:** Insurance premiums are modelled as a share of GDP. Life insurance premiums rise from **3% of GDP in FY2023 to 4% by 2070**, while general insurance premiums rise from **0.97% to 2.9%** over the same period.
- **Asset allocation:** Both portfolios remain largely invested in government securities, though this share gradually declines over time as allocations to corporate bonds and other assets increase.
- **Returns, benefits, and expenses:** Returns are based on long-term assumptions for government securities, corporate bonds, and equity. Benefit ratios remain broadly stable, while expense ratios decline gradually.

3. Mutual Funds

- **AUM projection basis:** AUM is projected using net fund mobilisation, investment income, and expenses.
- **Mobilisation assumption:** Fund inflows are linked to the share of household financial savings entering mutual funds, which is assumed to rise from **6% in FY2023 to 12% by 2070** as household savings increasingly shift towards market-linked products.
- **Asset allocation:** Mutual funds have the highest equity allocation among all institutional investors. In FY2023, portfolios consisted of approximately **53% equity, 34% debt, and 13% other assets**. Equity allocation is projected to rise further to **58% by 2070, and other assets fall to 8%**.
- **Returns and expenses:** Returns are driven by a larger equity mix and market-linked portfolio allocation. Expenses are modelled at roughly **0.5% of prior-year AUM** and assumed to remain broadly stable over time.

Table A1. Investment projection for sectors

Particulars	Power	Transport	Industries
Equity investment allocation	Equity allocation across institutional investors (FY2023): Life insurance **19%**, general insurance **19%**, pension fund **17%**, EPFO **9%**, and mutual funds **53%** for **FY2023**. We have used sectoral weight of each sector in broader market index as a proxy to project equity investment allocations as these investors follow broader market index.		
Sectoral weight: Equity	Historical average sectoral weight of **3%** (FY2019–2023), assumed to rise to **5% by 2070**. Within power, share of renewable energy is expected to grow from **32.5% to 90% by 2050**, as renewable capacity expands; renewable energy composition in the energy sector is expected to increase.	Assumed to remain at the historical average of **5.3%** (FY2019–2023). Unlike renewable energy, the structure of transportation sector will not change.	Assumed to remain at the historical average of **6.3%** (FY2019–2023).
Alternative investment allocation	Alternative asset allocation across institutional investors **(FY2025)**: life insurance **0.3%**, general insurance **0.2%**, pension fund **0.2%**, EPFO **0.07%**, and mutual funds **0.5% for FY2025**. The weighted average is approximately **0.35% in 2025**, rising to **5% by 2050**. Financial sector reform, including deregulation of institutional investment over time will enable them to invest a higher portion of capital in alternative assets.		
Sectoral weight: Alternative investments	Sectoral weight of **~7.5% in FY2025** is assumed to increase to **10% by 2070**, supported by renewable expansion and greater use of InvITs.	Sectoral weight of **0.5%** is assumed to increase to **8% by 2070**, mainly through securitisation of EV and fleet loans.	Sectoral weight of **0.5%** is assumed to increase to **2% by 2070** as technologies mature.
Corporate bond allocation	Debt allocation across institutional investors (FY2023): life insurance 2.7%, general insurance 6.1%, pension fund 27.5%, EPFO 23%, and mutual funds 33%. The projected allocation by 2050 is: life insurance **5%**, general insurance **7.7%**, pension fund **34%**, EPFO **22.5%**, and mutual funds **34%**. Expected deepening of bond market will enable them to invest higher capital in corporate bonds.		
Sectoral weight: Corporate bonds	Sectoral allocation is assumed to remain at **5.15%**, based on the historical average (FY2017–2023). The share of bonds issued by renewable energy companies within the electricity sector is assumed to rise from **9% in 2025 to 100% by 2065**, and remain there thereafter.	Assumed to remain at **0.05%**, based on the historical average (FY2017–2023).	Assumed to remain at **2%**, based on the historical average (FY2017–2023).

About Climate and Sustainability Initiative (CSI)

Climate and Sustainability Initiative (CSI) is an international think tank, research and advisory institution headquartered in Singapore, with an office in New Delhi, working at the intersection of climate policy and climate finance, with focus on implementable solutions for developing countries in the Global South. Through a whole-of-society approach, CSI combines actionable research, econometric modelling, economic and financial analysis and investment structuring to help translate net-zero ambitions into policy action and investable pathways. The organisation is guided by an advisory group drawn from diverse fields across policy, finance, and public administration, ensuring rigour and relevance.

CSI works closely with national and sub-national governments, public financial institutions, academic partners, and investors, including supporting India's Net Zero 2070 agenda through engagements with NITI Aayog, multilaterals and development finance institutions institutional investors, and industry stakeholders across power, transport, industry, and emerging green technologies.

About the authors

CA SHUBHANSH GARG, CFA

shubhansh.garg@csiglobal.co

Shubhansh Garg is a Senior Analyst at Climate and Sustainability Initiative (CSI), supporting research and advisory engagements across climate finance, transition pathways, and financial resilience. His work focuses on climate investment, sustainable finance, and strategies to accelerate India's net-zero transition. He is a Chartered Accountant (CA) and a Chartered Financial Analyst (CFA).

LABANYA PRAKASH JENA, CFA

labanya.jena@csiglobal.co

Labanya Prakash Jena is a Director at the Climate and Sustainability Initiative (CSI). He is a thought leader in climate finance, ESG, and sustainable finance, with leadership experience across leading climate research institutions. His experience includes leadership roles at the Climate Policy Initiative (CPI), where he led the Centre for Sustainable Finance initiative in India, as well as at the Commonwealth, UNDP, WRI, and GIZ. He is also an Agenda Contributor at the World Economic Forum (WEF) and a key member of the ESG initiative at CFA Society India. He contributed to NITI Aayog's report on Net Zero Financing Needs for Viksit Bharat. Mr. Jena is a CFA charterholder from the CFA Institute, has completed the Sustainability and Climate Risk Certification Program offered by GARP and the University of Oxford, and is currently a Doctoral Scholar in Green Finance at XLRI, Jamshedpur.

CLIMATE AND SUSTAINABILITY INITIATIVE (CSI)

New Delhi Office: 4th Floor, Plot No. 67,
Okhla Industrial Area, Phase III,
New Delhi – 110020

info@csiglobal.co | www.csiglobal.co

Climate and Sustainability Initiative