INDIA'S CARBON ACCOUNTING AND CLIMATE ACTION FRAMEWORK: COMPREHENSIVE TABULAR REFERENCE

This comprehensive tabular framework provides a structured overview of India's carbon accounting, climate policy, and environmental regulatory landscape. The framework is organized into seven major components covering 56 distinct regulatory and policy instruments, standards, and mechanisms.

Part A: Foundational Acts and Legislation

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India's carbon accounting framework is built upon several foundational acts that provide the legal basis for greenhouse gas regulation, carbon markets, and climate action.

Topic/Regulation	Gazette Notification & Date	Category	Key Standards/Limits	Implementing Authority	Penalty for Non-Compliance
Environment (Protection) Act, 1986	Act No. 29 of 1986, dated 23.05.1986	Environmental Protection/Carbon Regulation	Empowers notification of emission standards for industries. Basis for Scope 1, 2, 3 emissions regulation under GHG Protocol framework	MoEFCC (Policy), CPCB (Technical Standards), SPCBs (Enforcement)	Imprisonment up to 7 years or fine up to ₹5 crore for continued violations under Jan Vishwas Act 2023
Energy Conservation Act, 2001	Act No. 52 of 2001, dated 29.09.2001	Energy Efficiency/GHG Reduction	Mandates energy efficiency targets for designated consumers. SEC reduction targets: 4-6% for different industries under PAT scheme	Bureau of Energy Efficiency (BEE), Ministry of Power	Penalty for non-compliance with SEC targets: Forfeiture of ESCerts + monetary penalty at market rate

Energy Conservation (Amendment) Act, 2022	Amendment Act 2022, dated 12.08.2022	Carbon Trading/Climate Action	Establishes carbon credit certificates (CCCs) denominated in tCO2e. Emission intensity targets for 9 energy-intensive sectors	Bureau of Energy Efficiency (BEE), National Steering Committee for ICM	Financial penalties, suspension of trading rights, mandatory purchase of carbon credits at penalty rates
National Action Plan on Climate Change (NAPCC), 2008	Released 30.06.2008	Climate Policy Framework	Targets: 33-35% reduction in GDP emission intensity by 2030; 40% renewable energy capacity; 2.5-3 Gt CO2 carbon sink	Prime Minister's Office, MoEFCC, Nodal Ministries for each mission	No specific penalties (policy framework), but linked to specific mission implementations
Forest (Conservation) Act, 1980	Act No. 69 of 1980, dated 25.10.1980	Carbon Sequestration/Forest Protection	Compensatory afforestation at 1:1 ratio minimum. Net Present Value calculation for forest carbon accounting	MoEFCC (Forest Clearance), State Forest Departments	Imprisonment up to 15 days for violating diversion norms affecting carbon accounting
National Green Tribunal Act, 2010	Act No. 19 of 2010, dated 18.10.2010	Environmental Adjudication	Handles cases related to carbon accounting violations, climate risk disclosure non-compliance, and carbon market disputes	National Green Tribunal (Principal and Regional Benches)	Imprisonment up to 3 years or fine up to ₹10 crore for non-compliance with tribunal orders

Part B: Carbon Accounting Standards and Frameworks

The carbon accounting ecosystem in India is supported by various international and national standards adapted for local implementation.

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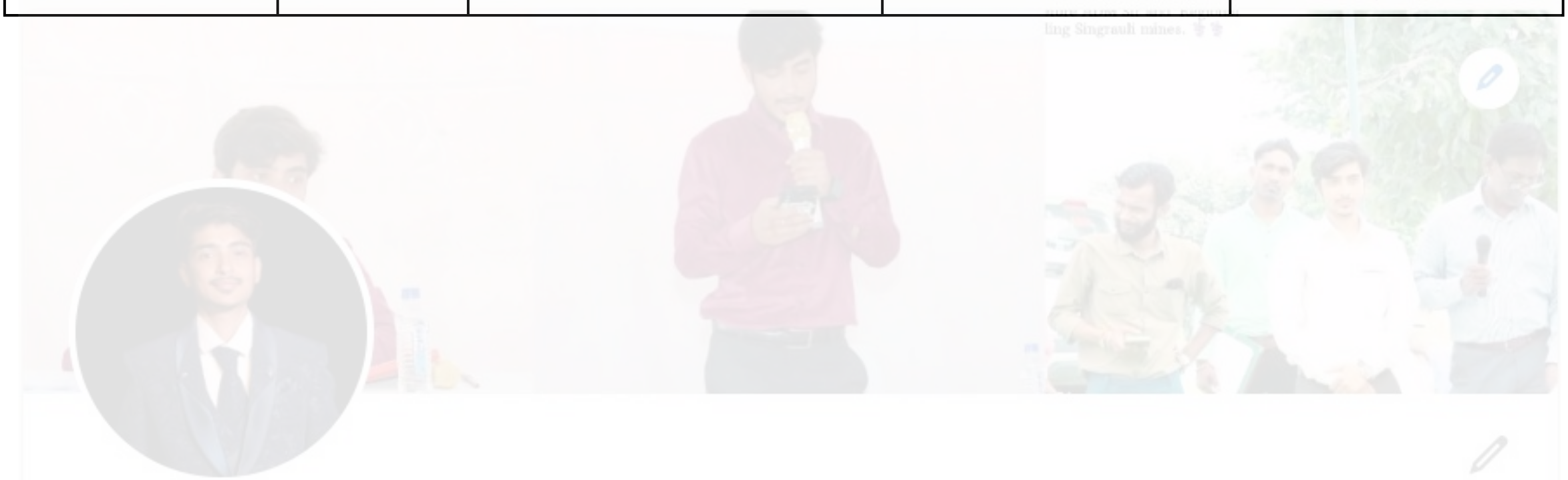
Topic/Regulation	Category	Key Standards/Limits	Applicability	Implementing Authority
GHG Protocol Corporate Standard (India Implementation)	Corporate GHG Accounting	Scope 1 (Direct): ∑(Activity Data × Emission Factor). Scope 2 (Indirect): Energy Consumption × Grid Emission Factor. Scope 3 (Value Chain): 15 categories defined	All companies conducting GHG accounting in India. Mandatory for companies with SBTi commitments and CDP reporting	WRI India, CII, TERI (Technical Support), Individual Companies (Implementation)
India GHG Program (WRI-CII-TERI)	National GHG Program	Emission Factor Database: India-specific factors for different fuels, electricity grid, industrial processes. Energy Intensity Benchmarks: Sector-specific energy intensity targets	Voluntary participation by Indian companies. Over 100 founding members including Tata, Infosys, ITC, NTPC	WRI India, Confederation of Indian Industry (CII), The Energy and Resources Institute (TERI)
ISO 14064 Standards for GHG Accounting	International Standard	ISO 14064-1: Organization-level GHG quantification. ISO 14064-2: Project-level GHG quantification. ISO 14064-3: GHG verification and validation	All organizations implementing GHG accounting systems. Required for carbon credit projects and verification	Bureau of Indian Standards (BIS), Accreditation Bodies, Third-party Verifiers
IPCC Guidelines for National GHG Inventories	National Inventory Guidelines	IPCC Default Emission Factors: CO2: 94.6 TJ/kt (Coal), 73.3 TJ/kt (Diesel). CH4: 1 kg/TJ (Natural Gas). N2O: 1.4 kg/TJ (Coal). Country-specific factors available	National government for BUR preparation. Research institutions for GHG research and policy development	Ministry of Environment, Forest and Climate Change (MoEFCC), Indian Meteorological Department

Science Based Targets Initiative (SBTi) India	Target Setting Framework	Absolute Reduction: 4.2% annually for Scope 1+2. Economic Intensity: 7% annually. Sector-specific pathways for different industries	Indian companies with science-based targets. Over 300 Indian companies committed as of 2024	Science Based Targets Initiative (Global), Indian companies (Implementation)
Carbon Disclosure Project (CDP) India	Climate Disclosure Platform	Scoring System: A-D grades based on disclosure quality. Covers emissions data, reduction targets, transition plans, climate governance	Companies reporting to CDP India. Over 1000 Indian companies participate annually	CDP Worldwide (Global), CDP India (Local coordination)
TCFD Implementation in India	Climate Risk Disclosure	Core Metrics: Scope 1, 2, 3 emissions; Climate-related risks and opportunities; Scenario analysis (1.5°C, 2°C, 3°C+); Transition plans	Listed companies, financial institutions, large corporates. RBI guidelines under development	Companies (Voluntary), SEBI (Regulatory oversight under development)
ISSB Standards - India Adoption	Sustainability Reporting	Climate Metrics: GHG emissions by scope; Climate-related risks and opportunities; Cross-industry metrics; Industry-specific metrics	Large companies, listed entities, financial institutions. Phased implementation expected from 2025	IFRS Foundation (Global), Indian Accounting Standards Board (Local adaptation)



Part C: Carbon Market Mechanisms and Trading Schemes

India's carbon market infrastructure encompasses both compliance and voluntary mechanisms for emission reduction trading.

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Topic/Regulation	Gazette Notification & Date	Category	Key Standards/Limits	Penalty for Non-Compliance
Carbon Credit Trading Scheme (CCTS) 2023	Notification S.O. 2431(E) dated 28.06.2023	Compliance Carbon Market	Compliance Mechanism: Emission intensity targets for 9 sectors. CCCs denominated in 1 tCO2e. Offset Mechanism: Voluntary participation, project-based credits. Banking: 20% of surplus credits can be banked. Penalty: 2x market price for non-compliance	Compliance entities: Monetary penalty at 2x prevailing market price for shortfall. Trading suspension for repeated violations. Voluntary participants: No penalties but affects credibility
Perform, Achieve and Trade (PAT) Scheme	Operational since 2012, Rolling cycles	Energy Efficiency Trading	PAT Cycle III: 116 DCs, 1.06 MToE reduction target. ESCerts: 1 certificate = 1 TOE saved. Trading: Energy Saving Certificates traded on power exchanges. Penalty: Forfeiture + market price penalty	Forfeiture of allocated ESCerts. Additional penalty equal to market price of shortfall certificates. Exclusion from future PAT cycles for repeated violations
Renewable Energy Certificates (REC) Mechanism	Operational since 2011	Renewable Energy Trading	REC Validity: 365 days from date of issuance. Minimum purchase: 100 kWh. Price: Floor price ₹1.50/kWh, Forbearance price ₹3.00/kWh. Solar/Non-solar categories maintained separately	Penalty for non-compliance with RPO: ₹1.50-3.00 per kWh shortfall. State regulatory commissions may impose additional penalties
Green Credit Program (GCP) 2023	Notification dated 12.10.2023	Green Action Incentive	Green Credits: 1 GC = specific quantified environmental benefit. Afforestation: 1 GC per tree planted and maintained for 2 years. Water Conservation: 1 GC per 1000 liters	No penalties (voluntary mechanism). However, false claims may result in credit cancellation and exclusion from program

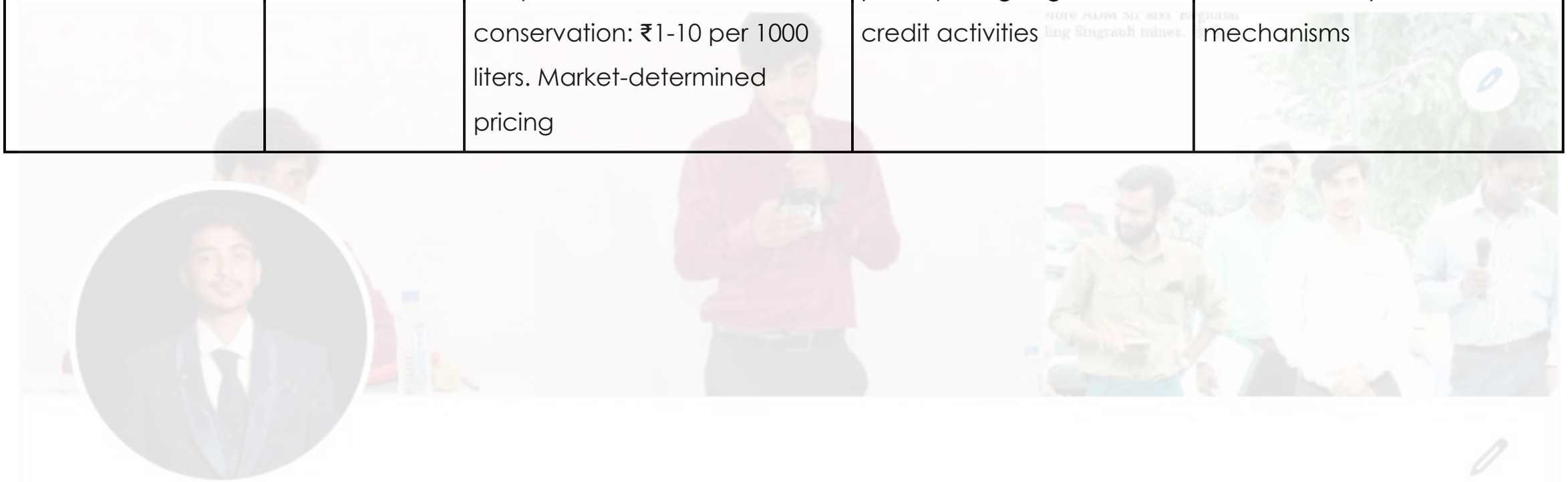
			saved annually. Registry: Digital platform for credit issuance and trading	
Clean Development Mechanism (CDM) Projects	Operational since 2005	International Carbon Market	CER Price: Historical $5-20/tCO2e. Additionality: Mandatory demonstration. Validation: Third-party verification. Methodology: UN-approved methodologies. Permanence: Long-term monitoring required	Project cancellation for non-compliance. Credit cancellation for over-crediting. Exclusion from future CDM participation
Verified Carbon Standard (VCS) Projects	Operational since 2006	Voluntary Carbon Market	VCU Price: $1-50/tCO2e depending on project type. Additionality: Project must pass additionality test. Validation: Independent third-party validation. Methodology: VCS-approved methodologies. Vintage: Credits valid for specific time periods	Credit cancellation for non-compliance. Exclusion from VCS registry. Legal action for fraudulent claims
Gold Standard Carbon Credits	Operational since 2003	Voluntary Carbon Market	Price Premium: 20-30% above VCS prices. SDG Impact: Mandatory contribution to ≥3 SDGs. Additionality: Must demonstrate environmental and sustainable development additionality. Micro-scale: Special provisions for small-scale projects	Credit cancellation and exclusion from Gold Standard. Higher penalties due to premium nature of credits
Article 6 Mechanisms (Paris Agreement)	Under development post-2015	International Carbon Market	Article 6.2: Bilateral cooperative approaches with corresponding adjustments. Article 6.4: Centralized crediting mechanism. Article 6.8: Non-market approaches including climate finance and technology transfer	Corresponding adjustments may be suspended. Exclusion from international carbon markets. Affects international climate finance access

Part D: Carbon Pricing and Taxation Mechanisms

India's carbon pricing landscape includes direct taxes, implicit pricing through fuel taxes, and emerging market mechanisms.

Topic/Regulation	Category	Key Standards/Limits	Applicability	Implementing Authority
Coal Cess (Now Clean Energy Cess)	Carbon Tax/Cess	Coal Cess: ₹400 per tonne of coal (2016-present). Equivalent to ~$1.2 per tonne CO2. Revenue: ₹30,000+ crores annually. Utilization: National Clean Energy Fund (NCEF)	All coal producers, importers, and consumers. Covers thermal power plants, steel plants, cement industries, other coal-based industries	Central Board of Indirect Taxes and Customs (CBIC). Fund Management: Ministry of Finance. Utilization: Ministry of New and Renewable Energy
Fuel Excise Taxes (Implicit Carbon Pricing)	Implicit Carbon Pricing	Petrol: ₹19.9/liter excise + ₹13.69/liter VAT (avg). Diesel: ₹15.8/liter excise + ₹18.38/liter VAT (avg). Effective carbon price: ₹12,000-15,000 per tonne CO2	All fuel consumers including transport, industry, commercial, residential sectors. Covers petrol, diesel, LPG, CNG	Central Government (Excise), State Governments (VAT/Sales Tax). Price monitoring: Ministry of Petroleum and Natural Gas
Electricity Duty and Environmental Surcharge	Electricity Carbon Pricing	Electricity Duty: 5-20% of electricity bill. Environmental Surcharge: ₹0.005-0.05 per kWh. Green Energy Fund: State-specific utilization	All electricity consumers. Varies by state and consumer category (industrial, commercial, residential)	State Electricity Regulatory Commissions (SERCs). Collection: State Electricity Boards. Utilization: State governments
Plastic Waste Management Fee	Plastic Carbon Pricing	Plastic Waste Fee: ₹10-20 per kg for non-compliance. EPR targets: 70% by 2024-25. Environmental Compensation: ₹5-10 per kg shortfall	Plastic producers, importers, brand owners (PIBOs) under EPR obligations. Covers packaging materials, single-use plastics	Central Pollution Control Board (CPCB). EPR Portal: CPCB. Monitoring: State Pollution Control Boards
Environmental Compensation Mechanism	Environmental Penalty	Environmental Compensation: ₹1-10 crore per incident. Air pollution: ₹1-5 lakh per day.	All entities violating environmental norms. Covers industrial units,	Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs).

		Water pollution: ₹5-25 lakh per incident. Non-compliance multiplier: 2-5x	construction projects, infrastructure developments	Adjudication: Environmental tribunals
Internal Carbon Pricing (Corporate)	Corporate Carbon Pricing	Internal Price Range: $10-150 per tonne CO2. Average: $25-50 per tonne CO2. Application: Investment decisions, risk assessment, target setting	Multinational companies, listed companies, companies with sustainability commitments. Voluntary adoption but growing mandate	Individual companies (Self-implementation). Guidance: Industry associations, sustainability consultants
Carbon Border Adjustment Mechanism (CBAM) Impact	Trade Carbon Pricing	CBAM Price: €20-80 per tonne CO2 (2023-2026). Sectors: Cement, iron & steel, aluminum, fertilizers, electricity, hydrogen. Indian Response: Domestic carbon pricing consideration	Indian exporters to EU in covered sectors. Affects competitiveness and drives domestic carbon pricing needs	European Union (Implementation). Indian Response: Ministry of Commerce, Ministry of Environment, BEE
Green Credit Pricing Mechanism	Green Action Pricing	Green Credit Price: ₹500-5000 per credit. Afforestation: ₹100-500 per tree. Water conservation: ₹1-10 per 1000 liters. Market-determined pricing	Individuals, communities, companies, institutions participating in green credit activities	ICFRE (Administrator). Registry: Digital platform. Price discovery: Market mechanisms



Part E: Climate Finance and Adaptation Frameworks

India's climate finance architecture supports both mitigation and adaptation initiatives through various national and international mechanisms.

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Topic/Regulation	Category	Key Standards/Limits	Applicability	Penalty for Non-Compliance
National Adaptation Fund for Climate Change (NAFCC)	National Adaptation Finance	Fund Size: ₹350 crores (2015-2023). Allocation: 70% states, 30% national entities. Focus: Agriculture, water, forestry, coastal areas. Project Size: ₹1-50 crores. Duration: 3-5 years	State governments, national institutions, civil society organizations, research institutions implementing adaptation projects	Fund recovery for non-compliance with project objectives. Exclusion from future funding. Audit and investigation
Green Climate Fund (GCF) - India Portfolio	International Climate Finance	GCF Portfolio: $1.2 billion approved. Mitigation: 60%, Adaptation: 40%. Sectors: Renewable energy, energy efficiency, sustainable transport, agriculture. Leverage Ratio: 1:3-5	Government entities, development banks, private sector entities, civil society organizations implementing climate projects	Suspension of funding for non-compliance. Cancellation of projects. Refund of disbursed amounts
Climate Investment Funds (CIF) - India	Multilateral Climate Finance	CIF Allocation: $975 million. Clean Investment Program: $425 million. Scaling Solar: $125 million. Forest Investment Program: $300 million. Concessional Rate: 0.75-2.5%	Government of India, public sector entities, private sector companies in clean energy and climate resilience sectors	Suspension of loans. Prepayment obligations. Exclusion from future CIF funding
ESG Disclosure Requirements (SEBI)	Corporate Climate Disclosure	Applicability: Top 1000 companies by market cap. Reporting: Annual Business Responsibility and Sustainability Report (BRSR). Metrics: GHG emissions, water usage, waste generation, energy consumption	Top 1000 listed companies by market capitalization. Phased implementation for smaller companies	Monetary penalties up to ₹1 crore. Suspension of trading. Delisting from stock exchange
Green Bonds Framework	Green Financial Instruments	Green Bond Size: ₹1.7 lakh crores issued (2018-2024). Use of Proceeds:	Corporate issuers, sovereign entities,	Debarment from green bond issuance. Penalties

		Renewable energy (40%), sustainable transport (25%), water management (20%), waste management (15%). Verification: Third-party certification	multilateral development banks, financial institutions issuing green bonds	for misuse of proceeds. Investor lawsuits
Climate Risk Disclosure Guidelines	Climate Risk Management	Stress Testing: Physical risk scenarios (1.5°C, 2°C, 3°C). Transition Risk: Policy changes, technology shifts, market changes. Disclosure: Annual risk assessment reports	Banks, NBFCs, insurance companies, asset management companies, pension funds, sovereign wealth funds	Regulatory action by RBI. Penalties for inadequate risk management. Mandatory remedial action
Sustainable Finance Taxonomy	Sustainable Finance Classification	Green Activities: Renewable energy, energy efficiency, sustainable transport, waste management, water conservation. Amber Activities: Transitional activities. Red Activities: Harmful activities	All economic sectors, financial institutions, investors, regulators, policymakers involved in sustainable finance	Exclusion from sustainable finance incentives. Regulatory scrutiny. Reputational damage
Loss and Damage Financing Mechanism	Climate Damage Finance	Fund Target: $100 billion annually by 2030. India Contribution: $50 million pledged. Recipient Priority: Small island states, least developed countries, vulnerable communities	Climate-vulnerable communities, small island developing states, least developed countries, indigenous communities	Suspension of climate finance access. Exclusion from international climate funds. Diplomatic consequences

Part F: Digital Platforms and Monitoring Systems

India's digital infrastructure supports comprehensive monitoring, reporting, and verification of environmental and climate data.

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Topic/Regulation	Category	Key Standards/Limits	Applicability	Implementing Authority
Online Continuous Emission Monitoring System (OCEMS)	Emission Monitoring System	Coverage: 17 categories of highly polluting industries. Parameters: PM, SO2, NOx, CO, pH, BOD, COD, TSS. Frequency: Real-time, 24/7 monitoring. Data Transmission: Automatic to CPCB/SPCB servers. Accuracy: ±5% for gaseous pollutants, ±10% for liquid effluents	Mandatory for 17 categories: Cement, thermal power, refineries, fertilizers, petrochemicals, tanneries, pulp & paper, sugar, distilleries, iron & steel, zinc, copper, aluminum, caustic soda, pesticides, dyes, and common ETPs	Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs). Technology providers: CPCB-empanelled vendors
PARIVESH Portal (Environmental Clearance)	Environmental Clearance Platform	Project Categories: Category A (national), Category B (state). Processing Time: 105-210 days. Success Rate: 78% approvals. Applications: 40,000+ annually. Integration: GIS-based validation, payment gateway	All projects requiring environmental clearance. Category A: Large projects (national level). Category B: Medium projects (state level). Covers 35+ industrial sectors	Ministry of Environment, Forest and Climate Change (MoEFCC). Technical support: National Informatics Centre (NIC)
EPR Portal (Extended Producer Responsibility)	Waste Management Platform	Waste Types: Plastic, E-waste, Battery, Tyre, Oil. EPR Targets: 70% by 2024-25. Credits: Tradeable certificates. Compliance: Real-time tracking. Penalties: Automated calculation	Producers, importers, brand owners (PIBOs) under EPR obligations. Covers plastic packaging, electronics, batteries, tyres, used oil waste streams	Central Pollution Control Board (CPCB). Technical support: TCS, Infosys, other IT partners
Carbon Credit Registry Platform	Carbon Trading Platform	Credit Unit: 1 CCC = 1 tCO2e. Sectors: 9 energy-intensive	Obligated entities under CCTS, voluntary participants, carbon	Bureau of Energy Efficiency (BEE).

		industries. Registry: Blockchain-based. Trading: T+2 settlement. Validity: 5 years. Banking: 20% of surplus credits	credit developers, traders, buyers, compliance buyers	Technology partner: Power exchanges, IT solution providers
Green Credit Registry	Green Action Platform	Credit Unit: 1 GC = defined environmental benefit. Activities: Afforestation, water conservation, waste management. Validity: 10 years. Trading: Market-based pricing. Verification: Third-party	Individuals, communities, companies, NGOs, government institutions participating in green activities	Indian Council of Forestry Research and Education (ICFRE). Technology partner: ICX (subsidiary of IEX)
Comprehensive Environmental Pollution Index (CEPI)	Pollution Assessment System	Scoring: 0-100 scale. Categories: CPA (≥70), SPA (60-70), OPA (<60). Parameters: Air, water, land pollution. Frequency: Annual assessment. Clusters: 100+ industrial areas	Industrial clusters with high pollution potential. Covers 100+ clusters across India including manufacturing hubs and industrial areas	Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs). Research support: IIT, NEERI
Digital MRV (Monitoring, Reporting, Verification)	Climate Data Management	Standards: ISO 14064, GHG Protocol. Data: Activity data, emission factors. Verification: Third-party audits. Reporting: Annual submissions. Integration: National GHG inventory	Government agencies, research institutions, private companies, international organizations involved in climate reporting	Ministry of Environment, Forest and Climate Change (MoEFCC). Technical support: Indian Space Research Organisation (ISRO), IMD
Climate Finance Tracking System	Finance Tracking System	Tracking: Project-wise, sector-wise, regional. Metrics: Disbursement, utilization, impact. Reporting: Quarterly, annual. Integration: National accounting systems	Government agencies, development banks, multilateral organizations, private sector entities implementing climate projects	Ministry of Finance, Ministry of Environment. Technical support: National Sample Survey Office (NSSO), CSO

Part G: Key Formulas and Case Studies for Carbon Accounting

This section provides essential calculation methodologies and real-world examples of carbon accounting implementation in India.

Application Area	Formula	India-Specific Factors	Case Study Example
Scope 1 GHG Emissions Calculation	Scope 1 = Σ(Activity Data × Emission Factor × GWP)	Coal: 2.14 tCO2/tonne, Natural Gas: 2.35 tCO2/thousand m³, Diesel: 2.68 tCO2/kL	Tata Steel: 2.1 tCO2e/tonne steel (2023), 15% reduction from 2015 baseline
Scope 2 GHG Emissions Calculation	Scope 2 = Energy Consumption × Grid Emission Factor	Grid EF: 0.82 tCO2/MWh (2022-23), State-specific factors available	Infosys: 100% renewable energy, 0.0012 tCO2e/employee (2023)
Scope 3 GHG Emissions Calculation	Scope 3 = Σ(Category Activity × Category Emission Factor)	India-specific factors: Business travel: 0.21 tCO2/passenger-km, Freight: 0.063 tCO2/tonne-km	ITC: Carbon positive since 2003, Scope 3 includes agriculture supply chain
Carbon Credit Calculation (CCTS)	CCC = (Baseline Emissions - Actual Emissions) / 1000	Baseline intensity targets set by BEE for 9 sectors	Ambuja Cement: Earned 2.5 million CCCs in PAT Cycle I
Energy Saving Certificates (PAT)	ESCert = (Baseline Energy - Actual Energy) / 1000	Sector-specific energy consumption benchmarks	JSW Steel: Achieved 120% of PAT target, earned 85,000 ESCerts

Emission Intensity Calculation	Emission Intensity = Total GHG Emissions / Economic Output	GDP deflator: 4-6% annually, Production-based intensity preferred	India: 0.61 tCO2e/$ GDP (2019), target: 0.45 tCO2e/$ GDP (2030)
Carbon Tax Calculation (Coal Cess)	Coal Cess = Coal Consumption (tonnes) × ₹400	Current rate: ₹400/tonne coal, Equivalent to ~$1.2/tCO2	NTPC: Paid ₹2,400 crores coal cess in 2023-24
Green Credit Quantification	GC = Quantified Environmental Benefit / Unit Conversion Factor	Afforestation: 1 GC/tree/2 years, Water: 1 GC/1000 L saved	Haryana: 5 million trees planted, earned 10 million GCs
Physical Climate Risk Assessment	Physical Risk = Probability × Impact × Vulnerability	India-specific hazard maps: Cyclone, flood, drought, heatwave	Mumbai: $2.7 billion potential loss from 1m sea level rise
Transition Risk Quantification	Transition Risk = Carbon Price × Carbon Intensity × Exposure	India carbon price: $10-50/tCO2 (internal), CBAM: €20-80/tCO2	Coal India: $15 billion stranded assets risk at $50/tCO2

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