Energy Systems (EN)

Power generation, grids, storage, fossil fuel transition

- CPI GLCF 2025 — Energy Systems (EN) Index
- Renewable Energy
- Energy Storage
- Grid & Distribution
- Hydrogen & Alternative Fuels
- Energy Access & Off-grid
- Fossil Fuel Transition

CPI GLCF 2025 — Energy Systems (EN) Index

source	cpi
source_version	GLCF 2025
source_name	CPI GLCF 2025 — Energy Systems (EN)
sector	EN
origo_nodes_mapped	TBD
last_verified	2026-05-26
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Description

CPI Global Landscape of Climate Finance 2025 coverage for: Power generation, grids, storage, fossil fuel transition. Populate with specific CPI sub-sector and activity nodes during Phase 0.

Cleantech Taxonomy Mapping Notes

[To be populated during Phase 1 schema alignment — document how this source node maps to Cleantech Taxonomy IDs, including convergences, divergences, and gaps.]


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Renewable Energy

Source Metadata

Field	Value
source	cpi
source_version	GLCF 2025
source_id	CPI-ES-001
sector	Energy Systems
subsector	Renewable Energy
mitigation	Y
adaptation	N
last_checked	2026-05-26

CPI Definition & Scope

Under CPI's Global Landscape of Climate Finance (GLCF) framework, Renewable Energy encompasses all capital flows directed toward the deployment, expansion, and scaling of power generation technologies that displace fossil fuel combustion. This is the single largest category of tracked climate finance, representing the majority of global mitigation investment. CPI tracks finance flowing to solar photovoltaic, concentrated solar power, onshore and offshore wind, small and large hydropower, geothermal, and biomass/biogas power generation projects.

Subsectors & Examples

- **Solar PV** — utility-scale, distributed rooftop, floating solar
- **Wind** — onshore wind farms, offshore fixed and floating turbines
- **Hydropower** — large-scale dams, run-of-river, small/micro hydro
- **Geothermal** — conventional hydrothermal, enhanced geothermal systems
- **Biomass & Biogas** — dedicated biomass power, waste-to-biogas, co-firing
- **Concentrated Solar Power (CSP)** — parabolic trough, solar tower

Mitigation & Adaptation Classification

Renewable energy is classified as **mitigation** in CPI's framework. It directly reduces greenhouse gas emissions by displacing fossil fuel generation. While some renewable projects (e.g., off-grid solar for climate-vulnerable communities) can have co-benefits for adaptation and resilience, CPI categorizes the primary finance flow as mitigation.

LATAM Relevance

Latin America has enormous renewable energy potential. Colombia is rapidly expanding wind and solar capacity, particularly in La Guajira for offshore and onshore wind. Peru has growing solar deployment in the southern desert regions and hydropower in the Andes. Costa Rica already generates over 98% of its electricity from renewables (primarily hydro, geothermal, and wind), serving as a regional benchmark. CPI data shows the region attracted significant renewable energy investment growth between 2018 and 2023.

Cleantech Taxonomy Crosswalk

Maps directly to Cleantech Taxonomy sector **ES** (Energy Systems), specifically nodes for solar generation, wind generation, hydropower, geothermal, and bioenergy. Cross-references may exist with **AF** (AFOLU) for biomass feedstock sourcing.

Energy Storage

Source Metadata

Field	Value
source	cpi
source_version	GLCF 2025
source_id	CPI-ES-002
sector	Energy Systems
subsector	Energy Storage
mitigation	Y
adaptation	N
last_checked	2026-05-26

CPI Definition & Scope

Energy Storage in CPI's GLCF framework covers finance directed at technologies that store electricity or thermal energy for later dispatch, enabling greater integration of variable renewable energy sources. The 2025 edition expanded coverage to include energy storage as a distinct tracked category, recognizing its critical role in the energy transition. CPI tracks investment across battery storage (grid-scale and behind-the-meter), pumped hydro storage, compressed air, and emerging long-duration storage technologies.

Subsectors & Examples

- **Battery Energy Storage Systems (BESS)** — lithium-ion grid-scale, behind-the-meter commercial/residential
- **Pumped Hydro Storage** — conventional and closed-loop systems
- **Thermal Energy Storage** — molten salt, ice storage, phase-change materials
- **Mechanical Storage** — compressed air, flywheel, gravity-based
- **Long-Duration Storage** — iron-air batteries, flow batteries, liquid air

Mitigation & Adaptation Classification

Energy storage is classified as **mitigation** in CPI's framework. By enabling higher penetration of variable renewables and reducing curtailment, storage directly supports decarbonization of the power sector. It also supports grid resilience, but the primary classification remains mitigation.

LATAM Relevance

Energy storage deployment in Latin America is accelerating as countries integrate more solar and wind capacity. Colombia's energy transition roadmap includes storage auctions to complement La Guajira wind projects. Chile leads the region in lithium-ion deployment and is home to significant lithium reserves. Peru's grid intermittency challenges from growing solar create opportunities for storage investment. Costa Rica, with its near-100% renewable grid, explores storage for managing seasonal hydro variability.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sector **ES** (Energy Systems) under storage-specific nodes. Cross-references with **IN** (Industry) for battery manufacturing and **XS** (Cross-Sectoral) for grid flexibility services.

Grid & Distribution

Source Metadata

Field	Value
source	cpi
source_version	GLCF 2025
source_id	CPI-ES-003
sector	Energy Systems
subsector	Grid & Distribution
mitigation	Y
adaptation	Y
last_checked	2026-05-26

CPI Definition & Scope

Grid and Distribution infrastructure in CPI's GLCF 2025 framework covers investments in electricity transmission and distribution networks that enable integration of clean energy sources. The 2025 edition specifically expanded tracking to include power grids as a distinct category. CPI captures finance flowing to grid modernization, smart grid technologies, interconnection infrastructure, and distribution network upgrades needed to accommodate distributed energy resources and variable renewables.

Subsectors & Examples

- **Transmission Infrastructure** — high-voltage lines, cross-border interconnectors
- **Distribution Network Upgrades** — smart meters, automated distribution, voltage regulation
- **Smart Grid Technologies** — demand response systems, grid management software, SCADA upgrades
- **Grid Interconnection** — renewable energy evacuation lines, substation upgrades
- **Microgrids** — community and industrial microgrids with renewable integration

Mitigation & Adaptation Classification

Grid infrastructure is classified as **dual-benefit** (mitigation and adaptation) in CPI's framework. Mitigation benefit comes from enabling renewable energy integration and reducing transmission losses. Adaptation benefit arises from increased grid resilience against climate impacts such as extreme weather, flooding, and heat waves that threaten power infrastructure.

LATAM Relevance

Grid modernization is a critical bottleneck for Latin America's energy transition. Colombia's ambitious renewable targets require substantial transmission investment to connect remote wind and solar zones (La Guajira, Cesar) to demand centers. Peru faces grid integration challenges as it scales Andean solar and Amazon hydropower. Costa Rica's regional interconnection via SIEPAC enables cross-border clean energy trading in Central America.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sector **ES** (Energy Systems) under grid and distribution nodes. Cross-references with **IC** (ICT) for smart grid digital solutions and **BU** (Buildings) for building-integrated distributed energy management.

Hydrogen & Alternative Fuels

Source Metadata

Field	Value
source	cpi
source_version	GLCF 2025
source_id	CPI-ES-004
sector	Energy Systems
subsector	Hydrogen & Alternative Fuels
mitigation	Y
adaptation	N
last_checked	2026-05-26

CPI Definition & Scope

Hydrogen and Alternative Fuels in CPI's GLCF 2025 framework tracks investment in the production, distribution, and end-use of green hydrogen and other low-carbon fuels. The 2025 edition added green hydrogen as a specifically tracked energy transition category. CPI captures finance directed at electrolysis plants, hydrogen transport and storage infrastructure, ammonia and synthetic fuel production, and sustainable aviation fuels (SAFs) where they substitute fossil fuels.

Subsectors & Examples

- **Green Hydrogen Production** — alkaline and PEM electrolyzers powered by renewables
- **Blue Hydrogen** — natural gas reforming with carbon capture
- **Hydrogen Infrastructure** — pipelines, compression, liquefaction, refueling stations
- **Green Ammonia** — hydrogen-derived ammonia for shipping fuel and fertilizer
- **Sustainable Aviation Fuels (SAF)** — bio-based and power-to-liquid jet fuels
- **Synthetic Fuels** — e-methanol, e-methane, Fischer-Tropsch fuels

Mitigation & Adaptation Classification

Hydrogen and alternative fuels are classified as **mitigation** in CPI's framework. These technologies provide decarbonization pathways for hard-to-electrify sectors including heavy industry, long-haul transport, and high-temperature industrial heat. They represent enabling infrastructure for deep decarbonization beyond direct electrification.

LATAM Relevance

Latin America is positioning itself as a global green hydrogen hub. Colombia's national hydrogen roadmap targets production in La Guajira leveraging cheap wind power. Chile leads the region with its National Green Hydrogen Strategy and is attracting international investment for export-oriented hydrogen projects. Peru has significant potential for green hydrogen production from its solar and wind resources. Costa Rica is exploring hydrogen for decarbonizing its transport sector beyond passenger vehicles.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sector **ES** (Energy Systems) for hydrogen production and infrastructure. Cross-references with **TR** (Transport) for hydrogen fuel cell vehicles and SAF, **IN** (Industry) for industrial hydrogen use, and **AF** (AFOLU) for biofuel feedstocks.

Energy Access & Off-grid

Source Metadata

Field	Value
source	cpi
source_version	GLCF 2025
source_id	CPI-ES-005
sector	Energy Systems
subsector	Energy Access & Off-grid
mitigation	Y
adaptation	Y
last_checked	2026-05-26

CPI Definition & Scope

Energy Access and Off-grid in CPI's GLCF framework captures finance directed toward extending clean energy services to underserved populations, primarily through decentralized renewable energy systems. CPI tracks investments in solar home systems, mini-grids, productive use appliances, and clean cooking solutions that leapfrog fossil fuel-based energy infrastructure. This category bridges climate mitigation and energy poverty alleviation, tracking both public and private capital flows.

Subsectors & Examples

- **Solar Home Systems** — pay-as-you-go solar kits, standalone PV systems
- **Mini-grids** — renewable-powered community-scale generation and distribution
- **Clean Cooking** — improved cookstoves, biogas digesters, electric cooking appliances
- **Productive Use Equipment** — solar water pumps, solar cold chains, agri-processing
- **Rural Electrification** — last-mile grid extension with renewable integration

Mitigation & Adaptation Classification

Energy access is classified as **dual-benefit** in CPI's framework. Mitigation comes from displacing kerosene, diesel generators, and traditional biomass with clean alternatives. Adaptation benefits arise from strengthening

energy resilience in climate-vulnerable communities, enabling climate-adaptive livelihoods such as solar-powered irrigation, and reducing indoor air pollution from traditional cooking fuels.

LATAM Relevance

While Latin America has relatively high electrification rates compared to other developing regions, significant energy access gaps remain in remote and indigenous communities. Colombia's Zonas No Interconectadas (non-interconnected zones) in the Pacific coast, Amazon, and insular regions are prime targets for off-grid solar and mini-grid investments. Peru's rural Amazon communities rely heavily on diesel generators, creating opportunities for clean energy leapfrogging. Costa Rica has near-universal access but supports regional clean cooking initiatives in Central America.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sector **ES** (Energy Systems) for off-grid energy. Cross-references with **XS** (Cross-Sectoral) for just transition and energy equity, and **AF** (AFOLU) for productive use in agriculture.

Fossil Fuel Transition

Source Metadata

Field	Value
source	cpi
source_version	GLCF 2025
source_id	CPI-ES-006
sector	Energy Systems
subsector	Fossil Fuel Transition
mitigation	Y
adaptation	N
last_checked	2026-05-26

CPI Definition & Scope

Fossil Fuel Transition in CPI's GLCF framework tracks finance directed at the managed phase-out of fossil fuel assets and infrastructure, as well as investments in transitional technologies that reduce emissions from existing fossil fuel systems. CPI captures investment in coal plant decommissioning, gas-to-renewable fuel switching, methane leak detection and abatement in oil and gas operations, and just transition programs for fossil fuel-dependent communities and workers.

Subsectors & Examples

- **Coal Plant Retirement** — accelerated decommissioning, repurposing of coal sites
- **Gas-to-Renewables Switching** — replacement of gas peaker plants with storage/renewables
- **Methane Abatement** — leak detection and repair (LDAR), flaring reduction, venting elimination
- **Just Transition Programs** — worker retraining, community economic diversification
- **Carbon Capture on Fossil Assets** — CCS/CCUS retrofits on existing plants

Mitigation & Adaptation Classification

Fossil fuel transition is classified as **mitigation** in CPI's framework. The direct reduction of greenhouse gas emissions through asset retirement, fuel switching, and methane abatement is the primary climate benefit. While

just transition programs have social adaptation dimensions, CPI categorizes the finance flow primarily under mitigation.

LATAM Relevance

Fossil fuel transition is highly relevant for major hydrocarbon-producing countries in the region. Colombia's government has signaled interest in halting new oil and gas exploration, making managed decline and economic diversification critical. Peru's natural gas sector faces long-term transition questions. Costa Rica banned oil exploration in 2021 and serves as a model for small countries pursuing fossil-free energy systems. The Just Energy Transition Partnership (JETP) model is being explored for several Latin American countries.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sector **ES** (Energy Systems) for fossil phase-out. Cross-references with **XS** (Cross-Sectoral) for just transition policy, **IN** (Industry) for industrial decarbonization, and **IC** (ICT) for methane monitoring technologies.