Assessing Top-Down Climate Finance Needs

Methodology

May 2024

CLIMATE POLICY INITIATIVE

CONTENTS

1. INTRODUCTION

While global climate finance has increased over the past decade, reaching an unprecedented level of nearly USD 1.3 trillion per year in 2021/2022, much more is needed to keep global temperature rises within 1.5°C and avoid the worst impacts of climate change (CPI, 2023).

Based on Climate Policy Initiative's compilation of climate finance needs estimates, annual climate finance flows must increase by at least sixfold on current levels, reaching USD 8.5 trillion per year between now and 2030, and over USD 10 trillion per year from 2031 to 2050. Accurately assessing the size of this global climate finance gap can enable decision-makers to mobilize finance effectively, quickly, and to where it is most needed.

Since 2021, CPI has strived to support a collective understanding of the climate finance needed to reach net zero carbon emissions by 2050. We compile and standardize data on climate finance needs from a wide variety of sources to provide the most comprehensive overview of the size of the climate finance gap available to date.

To clarify the global climate finance needs landscape, CPI has developed a novel approach to capturing all of these needs estimates in a clear and digestible manner. This document details the methodology used to produce our top-down climate finance needs estimates. Coupled with our wider tracking and analysis of climate finance flows, this can help identify the largest climate finance gaps, track progress against climate targets, and better inform decision-makers and financial institutions on how to increase the speed, scale, and quality of climate finance.

2. DEFINING CLIMATE FINANCE NEEDS

While there is not yet a globally accepted official definition of "climate finance needs", CPI distinguishes between two types of needs:

- **Top-down climate finance needs:** The estimated climate finance to fund the actions needed across different sectors to keep the average global temperature rise within 1.5°C by the end of this century. These needs are typically derived using predictive models for different sectors. Climate-compatible scenarios developed by different institutions can differ widely in the data, assumptions, model used, and (geographic or sectoral) scope.
- **Bottom-up climate finance needs:** The climate finance required by countries to reach their national climate targets, as stated in official documents such as Nationally Determined Contributions (NDCs). These needs include both the finance required to be raised domestically and the financial support required from international (public and private) sources. While some countries estimate their climate finance needs using predictive models aligned to a 1.5°C pathway, in most cases, bottom-up needs are derived from a list of costed mitigation and adaptation measures or projects countries aim to implement. Currently, total stated bottom-up needs are insufficient to keep global temperature rises within 1.5°C (UNFCCC, 2023).

This methodology document details CPI's approach to estimate top-down climate finance needs ("climate finance needs" from here on).

Given their different calculation methodologies, the top-down and bottom-up needs estimates each shed light on climate finance needs from a different perspective. Top-down needs take a technology-perspective outlining what would be technically required (and feasible) to put the world on a climate-compatible pathway. Bottom-up needs, on the other hand, take a country-perspective outlining domestic and international capital required to achieve national climate goals. However, as the ambition of current national targets is insufficient to reach a climate-compatible trajectory globally, bottom-up needs are materially lower than top-down needs.

3. CPI'S APPROACH TO ESTIMATING TOP-DOWN CLIMATE FINANCE NEEDS

CPI's climate finance needs are derived from the collection of needs estimates from a wide variety of sources (see Section 4). Several scenarios aligned with a transition to net zero already exist, using very different models and assumptions, and covering a range of sectors and geographies, with different level of granularity.

CPI's efforts have, therefore, been focused on compiling and standardizing existing needs estimates to ensure consistency and comparability of different scenarios, and on providing a comprehensive and unique understanding of the size of the climate finance gap.

As they use different assumptions, some of the scenarios included in this exercise may be incompatible with each other (e.g., 100% renewable-based power sector vs inclusion of fossil fuel plants using carbon removal technologies). To reflect this variability, our top-down climate needs estimates are presented as ranges of investments needed, rather than single values. **Our goal is not to validate the approach and assumptions used in each model, but rather to present a comprehensive and impartial overview of available needs estimates to date and provide a collective understanding of the order of magnitude of the finance required to align to a 1.5°C pathway.**

4. METHODOLOGICAL STEPS

COLLECTION OF NEEDS ESTIMATES

Our research has identified over 55 reports and publications including an assessment of future investment needs to meet climate and development goals. Among all 55 sources, only a part was reviewed based on internal criteria to prioritize source analysis. Table 1 includes the list of data sources reviewed and used for our needs estimates in each sector.

While we collected data from all the sources reviewed, we only processed and used a subset of scenarios for our final calculations. To avoid double counting, the final list of sources was narrowed down by:

- **Prioritizing more recent data** when referring to the same sector/technology and coming from the same scenario by the same institution (e.g., renewables in IEA 2023 NZE scenario vs renewables in IEA 2021 NZE scenario);
- **Prioritizing primary data sources** (e.g., if a report is referring to another document, the data from the original document is used, unless more granular or additional information can be gathered from the secondary source);
- **Prioritizing more granular data** when available (e.g., country vs region, sub-sector vs sector).

Table 1: Data sources reviewed and those used in our calculations to estimate top-down climate finance needs

Sector	Sources reviewed	Sources used in CPI needs estimations
Buildings & Infrastructure	**Bhattacharya et al.** (2022) **IEA** (2023a) **IEA** (2021) **IRENA** (2023) **IRENA** (2022) **LSE** (2021) **McKinsey** (2022) **Songwe et al.** (2022) **Vivid Economics** (2021)	**IEA** (2023a) **IRENA** (2023) **LSE** (2021) **McKinsey** (2022)
Agriculture, Forestry and Other Land Use (AFOLU)	**Bhattacharya et al.** (2022) **FOLU** (2019) **Harmsen et al.** (2019) **LSE** (2021) **McKinsey** (2022) **Paulson Institute** (2020) **Songwe at al.** (2022) **Thornton et al.** (2023) **UNEP** (2022) **Vivid Economics** (2021)	**FOLU** (2019) **LSE** (2021) **McKinsey** (2022) **Paulson Institute** (2020) **Thornton et al.** (2023) **UNEP** (2022)

Sector	Sources reviewed	Sources used in CPI needs estimations
Transport	**BNEF** (2022a) **BNEF** (2021) **IEA** (2019, 2020a, 2021, 2023a, 2023b, 2023c) **IRENA** (2023, 2022) **LSE** (2021) **McKinsey** (2022) **Songwe at al.** (2022) **Vivid Economics** (2021) **World Bank** (2019)	**BNEF** (2022a) **IEA** (2023a) **IRENA** (2023) **McKinsey** (2022)
Industry	**BNEF** (2022a) **IEA** (2021, 2023a, 2023b) **IRENA** (2022, 2023) **McKinsey** (2022) **NGFS** (2023) **Songwe at al.** (2022) **Vivid Economics** (2021)	**BNEF (2022a)** **IEA** (2021, 2023a) **IRENA** (2023) **McKinsey** (2022)
Energy Systems	**Bhattacharya et al.** (2022) **BNEF** (2021, 2022a, 2022b) **BP** (2023) **IEA** (2020b, 2021, 2023a, 2023b) **IPCC** (2022) **IRENA** (2022, 2023) **LSE** (2021) **McKinsey** (2022) **NGFS** (2023) **Songwe at al.** (2022) **Vivid Economics** (2021)	**BNEF** (2022a, 2022b) **IEA** (2021, 2023a) **IPCC** (2022) **IRENA** (2023) **LSE** (2021) **McKinsey** (2022)
Adaptation	**Baarsch et al.** (2015) **Bhattacharya et al.** (2022) **Chapagain et al.** (2020) **GCA** (2022) **LSE** (2021) **Markandaya and Eguino** (2018) **Songwe at al.** (2022) **UNEP** (2021, 2022, 2023) **World Bank** (2010) **World Bank and GFDRR** (2021)	**Bhattacharya et al.** (2022) **Chapagain et al.** (2020) **LSE (2021)** **Songwe et al.** (2022) **UNEP** (2023)

DATA EXTRACTION AND STANDARDIZATION

For all sources listed in Table 1, we extracted climate finance needs data available. Investment needs numbers were found in the following places:

- In the original source, explicitly mentioned in the publication body text;
- In the original source, included in a graph in the publication, in cases where no numbers were explicitly mentioned;
- As raw data directly available from open-access databases.

Original data extracted from different sources was very heterogeneous in terms of sector classification, timeframe considered, currency year, and type of value. To make needs estimates comparable, we standardized the data along these variables, as described in the sub-sections below.

SECTOR CLASSIFICATION

The sector/technology classification used by different sources can vary significantly even within the same sector, depending on the internal scope and taxonomy used. Original sector/technology classification was also often inconsistent with the taxonomy used by CPI to categorize climate finance flows in our Global Landscape of Climate Finance (GLCF) analyses (see Annex I), making it hard to compare flows and needs data.

For example, electric vehicle (EV) chargers are classified differently in different energy transition scenarios: the International Renewable Energy Agency (IRENA) includes EV chargers under Energy sector – End uses – Electrification, while the International Energy Agency (IEA) classifies them under Energy – Infrastructure. Given CPI's climate rather than energy-transition focus, our GLCF taxonomy categorizes EV chargers under Transport - Private Road Transport rather than Energy Systems.

In addition, some needs estimates included in the original sources refer to technologies that we do not consider to be climate solutions (e.g., fossil fuel generation, nuclear power).

To improve comparability and consistency across needs estimates and against CPI climate finance flows, once the original data was extracted, we proceeded to match each data point with the sectors and sub-sectors included in CPI's GLCF taxonomy (see Annex I), and excluded any technologies which cannot be classified as climate finance from our calculations.

TIMEFRAME CONSIDERED

The timeframe of needs data collected also vary: all sources provide investment needs estimates up to 2030, while only some extend their models to 2040 or 2050. Whenever projections were only done through 2030, we decided not to make any assumptions to extend the original projections to 2040/2050. As a result, the number of needs estimates included in the calculations vary depending on the considered timeframe, i.e., 2023-2030 or 2031-2050 (see Table 2).

The range of CPI investment needs estimates is narrower for the period 2031-2050 (USD 9.3-12.1 trillion) than for the period 2023-2030 (USD 5.4-11.7 trillion). This is in part because some of the scenarios with the highest needs estimates (e.g., IPCC, 2022; and LSE, 2021) only include projections up to 2030. In addition, some scenarios (e.g., BNEF, 2022b) assume that investment required in certain technologies will decline in 2031-2050 compared to 2023-2030.

Table 2: Sources included in calculations for estimates of annual investment needs over the periods 2023-2030 and 2031-2050

Sector	Sources with needs estimates to 2030	Sources with needs estimates to 2050
Buildings & Infrastructure	**BNEF** (2022a) **IEA** (2023a) **IRENA** (2023) **LSE** (2021) **McKinsey** (2022)	**BNEF** (2022a) **IRENA** (2023) **McKinsey** (2022)

Sector	Sources with needs estimates to 2030	Sources with needs estimates to 2050
Agriculture, Forestry and Other Land Use (AFOLU)	**FOLU** (2019) **LSE** (2021) **McKinsey** (2022) **Paulson Institute** (2020) **Thornton et al.** (2023) **UNEP** (2022)	**McKinsey** (2022) **Paulson Institute** (2020) **UNEP** (2022)
Transport	**BNEF** (2022a) **IEA** (2023a, 2021) **IRENA** (2023) **McKinsey** (2022	**BNEF** (2022a) **IEA** (2021) **IRENA** (2023) **McKinsey** (2022)
Industry	**BNEF** (2022a) **IEA** (2023a, 2021) **IRENA** (2023) **McKinsey** (2022)	**BNEF** (2022a) **IEA** (2021) **IRENA** (2023) **McKinsey** (2022)
Energy Systems	**BNEF** (2022a, 2022b) **IEA** (2021) **IEA** (2023a) **IPCC** (2022) **IRENA** (2023) **LSE** (2021) **McKinsey** (2022)	**BNEF** (2022a, 2022b) **IEA** (2021) **IRENA** (2023) **McKinsey** (2022)
Adaptation	**Bhattacharya et al.** (2022) **Chapagain et al.** (2020) **LSE** (2021) **Songwe et al.** (2022) **UNEP** (2023)	**Chapagain et al.** (2020)

CURRENCY YEAR

Most needs estimates found were expressed in nominal (current) USD, with different sources being published in different years. Where not stated in the original source, we assumed the currency year in which needs estimates was expressed to be the year of publication. To improve consistency and comparability of data, we standardized all investment needs estimates to 2022 USD billon, taking into account the inflation rates shown in Table 3.

Table 3: Inflation rates for currency conversion

Original currency year	Conversion rate to 2022 USD
2005	1.50
2010	1.34
2012	1.27
2015	1.23
2018	1.16
2019	1.14
2020	1.13
2021	1.08
2023	0.95

Source: US Inflation Calculator, available here.

TYPE OF VALUE

In the original sources, investment needs values were expressed variously as (i) annual average needs over a period (e.g., annual investment of USD 2.3 trillion needed through 2030); (ii) annual average needs reached by a time limit (e.g., annual investments to reach USD 2.3 trillion by 2030); or cumulative needs over a period (e.g., cumulative investments of USD 64.4 trillion needed through 2030).

We converted all needs data collected to needs estimates for each year between 2022 and 2030/2050, as follows:

- **Annual average needs over a period:** In these instances, we took the average annual investment for each year as per the original sources.
- **Annual average needs reached by a time limit:** In these instances, we assumed a linear growth of annual investment between the start and the end of the period, using the amount indicated in the original source as the starting value.
- **Cumulative needs over a period:** In these instances, we extrapolated the average annual investment as the cumulative needs divided by the number of years, unless otherwise indicated in the original source.

Whenever an original source expressed a needs estimate as a range rather than as a single value, we collected data for both the low and high values, and added a mean value into our database.

COMPILATION OF RESULTS

Once all data values were standardized, we proceeded to aggregate them by sector/ sub-sector/solution based on CPI's taxonomy (see Annex I) and depending on the granularity of the original scenarios considered. Whenever possible, we aimed to aggregate data at the climate solution level.

For each solution, we calculated high, low, and average annual needs values for the periods 2023-2030 and 2031-2050, as below:

- **High and low needs values:** For each solution, these are simply the highest needs estimates across all scenarios included in the calculations. For example, if Source A, Source B, and Source C estimated the annual climate finance needs for renewables to be USD 150 billion, USD 350 billion, and USD 300-450 billion, respectively, we would present the annual finance needs for renewables as the range USD 150-450 billion.
- **Average needs values:** For each solution, these were calculated as the average of average needs estimates in each scenario included in the calculations. In the example above, we would present the annual average finance need for renewables as USD 291.7 billion (i.e., the average between USD 150 billion, USD 350 billion, and USD 375 billion).

As explained above, needs estimates included in CPI's analysis come from a variety of scenarios, using different assumptions and projecting technology pathways that may be incompatible with each other (e.g., 100% renewable-based power sector vs inclusion of fossil fuel plants using carbon removal technologies). This calls for a rigorous interpretation of the results and is the reason why CPI's needs estimates are expressed in ranges of and/or average values (rather than single values), to provide an impartial understanding of the order of magnitude of the investment required to reach net zero carbon emissions by 2050 and align to a 1.5°C pathway.

5. DATA COVERAGE AND GAPS

Original scenarios used for final needs calculations cover different technologies and sectors at different levels of granularity. This means that the availability of needs data may vary significantly across sector/sub-sector/solution. Table 4 provides an overview of data coverage for each sector/sub-sector/solution, summarizing the number of data sources used in the final calculations. This makes it possible to identify key sectors, sub-sectors, and solutions for which available or usable needs estimates are missing.

Table 4: Number of data sources included in calculations each sector, sub-sector and solution, for the periods 2023-2030 and 2031-2050

Sector/subsector	Number of sources 2023-2030	Number of sources 2031-2050
ENERGY SYSTEMS	**7**	**6**
Power and heat generation	**6**	**5**
Renewables	6	5
Renewables retrofit	-	-
Hydrogen fuel cells	-	-
Energy storage	4	2
Fossil fuels with carbon capture and storage	3	2
Power and heat transmissions and distribution	**1**	**1**
District heating	1	1
Smart grid	-	-
Mini grid	-	-
Power grid retrofit	-	-
New power grid for renewables	-	-
Fuel production	**6**	**4**
Low emission fuels	6	4
Biogas	-	-
Biofuels	1	1
Hydrogen from renewables	3	2
Synthetic hydrocarbon fuels from carbon capture and green hydrogen	-	-
Fuel transmission and distribution	**1**	**1**
Green hydrogen transport and storage	1	1
Policy and national budget and support and capacity building	**-**	**-**
INDUSTRY	**5**	**4**
Industrial, extraction and manufacturing processes	**4**	**3**
Energy-use improvements and other greenhouse gas cuts	1	1
Cement Industry	-	-
Steel Industry	-	-
Substitution with hydrogen from renewables	-	-
Renewables and electrification	1	-
Renewables	-	-

Sector/subsector	Number of sources 2023-2030	Number of sources 2031-2050
Electrification	-	-
Carbon capture utilization and storage	2	2
Non-energy and fugitive greenhouse gas reduction	-	-
Oil refining	-	-
Coal mining extraction	-	-
Industry infrastructures and warehouses	**-**	**-**
Energy efficiency	-	-
Resilient Infrastructure	-	-
Upstream and midstream renewables	**-**	**-**
Raw material extraction and transformation	-	-
Manufacturing	-	-
Policy and national budget and support and capacity building	**-**	**-**
TRANSPORT	**5**	**4**
Private road transport	**5**	**4**
Low emission vehicles	5	4
Plug-in hybrid electric vehicles	-	-
Battery electric vehicles	2	2
Fuel cell electric vehicles	-	-
Eectric vehicles chargers	2	2
Infrastructure for low emission vehicles	-	-
Rail and public transport	**-**	**-**
Modal shift policy support	-	-
Energy efficiency - retrofit	-	-
New bus, light or heavy rail fleet and related infrastructures	-	-
Waterway	**-**	**-**
Energy efficiency - retrofit	-	-
New low-carbon fleet and related infrastructures	-	-
Aviation	**-**	**-**
Energy efficiency - retrofit	-	-
Modal shift policy support	-	-
Transport-oriented urban development and infrastructures	**-**	**-**
Policy and national budget and support and capacity building	**-**	**-**
AFOLU	**6**	**3**
Agriculture	**3**	**2**
Sustainable crops, agroforestry, livestock production	3	2
Sustainable crops	2	1
Agroforestry	1	1
Livestock production	1	1
Supply chain management (commercialisation, primary processing and storage)	-	-
Financial services for sustainable production and supply chain management	-	-
Forestry	**4**	**3**
Afforestation, reforestation, forest conservation, sustainable management of existing forest, including extraction of non-timber products	4	3
Re/afforestation	3	2
Forest conservation	3	2
Forest management	1	1

Sector/subsector	Number of sources 2023-2030	Number of sources 2031-2050
Supply chain management (commercialisation, primary processing and storage)	-	-
Fisheries	**2**	**1**
Sustainable fish production	2	1
Supply chain management (commercialisation, primary processing and storage)	-	-
Food and diet	**2**	**-**
Food waste	2	-
Low carbon diets	2	-
Policy and national budget and support and capacity building	**-**	**-**
BUILDINGS AND INFRASTRUCTURE	**5**	**3**
Building and infrastructure construction work	**1**	**1**
Energy efficiency - new construction	-	-
Energy efficiency - retrofit	1	1
Heating, ventilation, and air conditioning (HVAC) and water heaters	**4**	**3**
Energy efficient HVAC	-	-
Solar thermal	-	-
Other renewable energy-based	-	-
Heat pumps electrification	2	2
Appliances and lighting	**-**	**-**
Renewables	-	-
Electrification	-	-
Energy efficiency	-	-
Policy and national budget and support and capacity building	**-**	**-**
ADAPTATION	**5**	**1**
All adaptation (emerging markets and developing economies only)	5	1

6. DATA AND METHODOLOGY LIMITATIONS

To clarify the global climate finance needs landscape, CPI has developed a novel approach to capturing all existing needs estimates in a clear and digestible manner. We make best efforts to ensure a rigorous method to compile and standardize needs estimates in an impartial manner, though some limitations remain that affect the effectiveness of our approach and completeness of results. Our needs estimates should therefore be interpreted with the following data and methodology limitations in mind.

DATA LIMITATIONS

As described in Section 5, needs data for some sectors, sub-sectors, and solutions were missing or unusable. This includes data for many essential solutions, which we had to remove from the final calculations, such as supply chain needs included in IEA (2023b), sustainable infrastructures needs in Batthacharya et al. (2022), or energy supply and demand needs in BNEF (2022).

For some solutions (e.g., energy efficiency of waterway transportation) we could not find any needs estimate data. These solutions were either outside of the scope of the scenarios we reviewed, or they were included as part of broader sectors or sub-sectors with no explicit indication in the original reports and/or accompanying methodologies.

Where data was available, we sometimes faced the following challenges when trying to include, process, and standardize the data. These challenges, in some cases, limited our ability to use the data for the final calculations.

- **Data format.** Only a limited number of sources disclosed their needs estimates as raw data (in a dataset format), so in most cases, we extracted data in a text format from analytical reports. This is a highly time-consuming process that increases the possibility of mistakes and omissions.
- **Data standardization.** Different data sources use different taxonomies. Thus, the way technologies and solutions are categorized under each sector may differ greatly from one source to another. In many cases, the original source only provides a brief description of what is included under each sector and/or sub-sector and no accompanying methodology document exists that could provide more detail. This may affect our ability to correctly standardize data collected based on CPI's taxonomy (see Section 4 - Sector classification).
- **Insufficient granularity.** Building upon the previous point, the lack of a common categorization of sectors and technologies across data sources is further aggravated by the limited availability of granular needs data. Many sources provide needs estimates at the sub-sector level (e.g., renewables) rather than the solution level (e.g., solar PV, onshore wind).

This creates two possible challenges:

- **Risks of overlaps.** E.g., Source A provides an estimate for "solar and wind" and Source B provides an estimate for "wind and storage": the two cannot be averaged together as they do not have the same coverage.
- **Incomplete categories.** E.g. Source A provides an estimate for "solar and wind", Source B provides an estimate for "wind" but no estimate for "solar": in this case the estimate for "wind" cannot be averaged with the estimate for "solar and wind" as the scope is narrower.

Increased data granularity would enable categories to be reconfigured as needed, which would significantly simplify calculations by overcoming the issues of overlapping and unexhaustive categories.

METHODOLOGY LIMITATIONS

Our needs estimates compile and standardize data from a wide variety of scenarios. Our goal is to provide a comprehensive and impartial understanding of the order of magnitude of the investment required to reach net zero carbon emissions by 2050. Nevertheless, comparing and aggregating data from different scenarios brings a number of challenges that should be kept in mind when interpreting our needs estimates.

- Existing models typically integrate climate as well as non-climate solutions (e.g., fossil fuels) into their net-zero transition scenarios. Each model considers climate and non-climate solutions interdependently, where the projected evolution of the former affects that of the latter and vice versa. Climate and non-climate solutions under each model cannot be considered in isolation. **As CPI's needs estimates only cover climate solutions, our results should not be interpreted as the total investments required to align with a net zero pathway but, rather, as the investment required in climate mitigation and adaptation solutions as part of the broader capital requirements under a net zero scenario.**
- As they use different assumptions, some of the scenarios included in our calculations may be incompatible with each other (e.g., 100% renewable-based power sector vs inclusion of fossil fuel plants using carbon removal technologies). This is why our climate needs estimates are typically presented as ranges of investments, reflecting the variability of scenarios and assumptions behind the numbers. As such, **our results should be interpreted as a comprehensive and impartial indication of the order of magnitude of the investment required reflecting all existing scenarios, rather than a single absolute value of reference.**
- Our total needs estimates for mitigation (respectively, high, average, and low values) are calculated as the sum of estimated needs for each mitigation sector: AFOLU, Buildings & Infrastructure, Energy Systems, Industry, and Transport). However, the interdependency of solutions mentioned above implies an interdependency of sectors, as well. For example, if the investment required for a specific sector in a predictive model is low, this can be due to higher efforts (and, therefore, investments) to reduce greenhouse gas emissions in another sector. Thus, a low investment required, e.g., in Sector A, would be assumed to be coupled with a high investment in Sector B. Therefore, **CPI's high, average, and low needs values should not be interpreted as related to one single scenario but rather as reflecting the variability of scenarios used for the calculations.**

7. ANNEX I: CLIMATE FINANCE TAXONOMY USED IN CPI GLOBAL LANDSCAPE ANALYSES

Sector	Sub-sector	Mitigation or adapdation solution	Additional information and examples
Energy Systems	**Power & Heat Generation**	Biofuel/Biomass-fired	If a project's GHG emissions reductions are demonstrated compared with technically and economically viable alternatives
		Geothermal	
		Hydropower[1]	If a project's GHG emission reductions are demonstrated compared with technically and economically viable alternatives
		Hydrogen fuel cell	Using green hydrogen only
		Off-grid (renewables only)	Renewables only
		Other marine	Wave, Tidal, etc
		Solar – concentrated solar power	
		Solar – photovoltaic	Utility-scale and distributed
		Wind – offshore	
		Carbon capture use and storage in fossil fuel power plants	Incremental costs of CCUS technology only
		Waste-to-energy	E.g., incineration, gasification, pyrolysis and plasma with clear mitigation benefits
		Multiple	Unspecified renewable energy projects or projects that combine multiple energy sources
		Renewable retrofit	Energy efficiency in existing renewable power assets
		Resilient infrastructure and infrastructure for resilience	E.g., reduction in river flows leading to loss of generation from a hydroelectric plant

1 CPI does not count finance for large hydro projects from the private sector, or public sector finance for projects that do not demonstrate mitigation potential.

Sector	Sub-sector	Mitigation or adapdation solution	Additional information and examples
Energy Systems	**Power & Heat Transmission & Distribution**	District heating	Fueled by renewable energy only
		Smart grid	
		Mini grids	
		Power Grid – Retrofit	Retrofits that lead to clear energy efficiency gains
		Power Grid – New	That enable the integration of renewable power capacity
		Resilient infrastructure and infrastructure for Resilience	E.g., undergrounding of power lines
	Fuel Production	Biogas	Production of biogas connected to natural gas pipelines
		Biofuel	Biofuel production
		Hydrogen from renewables	
	Fuel Transmission & Distribution	NA	E.g., green hydrogen pipelines
	Policy & National Budget Support & Capacity Building	NA	
	Other/Unspecified	NA	Other energy projects, including general energy access development with clear mitigation and/or adaptation benefits
Industry	**Industrial, Extraction, and Manufacturing Processes**	Non-energy and fugitive GHG reduction	E.g., substitutions in industrial processes with associated GHG cuts
		Carbon capture use and storage	Excluding Energy sector – Incremental cost only
		Energy-use improvements and other GHG cuts	Energy consumption and GHG cuts in industrial processes
		Substitution with hydrogen from renewables	Industrial processes using hydrogen shifting from FF-based Hydrogen to RE-based hydrogen
	Industry Infrastructure & Warehouse	Energy efficiency	Low-consumption warehouses and light industry buildings
		Resilient infrastructure and infrastructure for resilience	E.g., improve the resilience of existing industrial plant/flood protection, etc.
	Policy & National Budget Support & Capacity Building	NA	
	Other/Unspecified	NA	

Sector	Sub-sector	Mitigation or adapdation solution	Additional information and examples
Waste	**Solid Waste**	Infrastructure and management (including recycling)	
	Policy & National Budget Support & Capacity Building	NA	
	Other/Unspecified	NA	
Water & Wastewater	**Water Supply & Sanitation**	Efficient large infrastructure	
		Basic water access	
	Waste Water Treatment	Infrastructure and management	Greenfield or brownfield projects that reduce methane or nitrous oxide emissions through wastewater, fecal sludge, or septage management
		NA	
	Policy & National Budget Support & Capacity Building	NA	Ex. Improved catchment management planning and regulation of water abstraction
	Other/Unspecified	NA	
Buildings & Infrastructure	**Building & Infrastructure Construction Work**	Energy efficiency - new construction	
		Energy efficiency - retrofit	
		Resilient infrastructure and infrastructure for resilience	
	HVAC & Water Heaters	Renewable energy-based hvac	
		Solar thermal water heaters	
		Energy efficient HVAC	Efficient cooling, etc.
	Appliances & Lighting	Efficient lighting systems (incl. public lighting)	E.g., LEDs
	Policy & National Budget Support & Capacity Building	NA	E.g., more robust building regulations and improved enforcement
	Other/Unspecified	NA	

Sector	Sub-sector	Mitigation or adapdation solution	Additional information and examples
Transport	**Private Road Transport**	Battery EVs	
		EV chargers	
	Rail & Public Transport	Modal shift policy support	
		Energy efficiency retrofits	Fleet Retrofit with clear energy efficiency gains
		New bus, light or heavy rail fleet and related infrastructure	With associated modal shifts from a higher-carbon transport mode. FF-powered rail engines are excluded
	Waterway	Energy efficiency - retrofit	Fleet Retrofit
		New low-carbon fleet and related infrastructure	
	Aviation	Energy efficiency - retrofit	
		Modal shift policy support	
	Policy & National Budget Support & Capacity Building	NA	
	Transport-oriented Infrastructure and Urban Development	Infrastructure for non-motorized transports	
		Resilient Infrastructure and Infrastructure for Resilience	E.g., Use of revised codes for infrastructure design that consider increased frequency or severity of extreme events
	Other/Unspecified	Modal Shift with Associated GHG Emission Cuts	
Information and Communications Technology	**Data Centers**	NA	New highly energy-efficient centers or energy-efficient retrofits
	Telecommunication Networks	NA	New highly energy-efficient networks or energy-efficient retrofits
		Resilient Infrastructure and Infrastructure for Resilience	
	Policy & National Budget Support & Capacity Building	NA	
	Other/Unspecified	NA	

Sector	Sub-sector	Mitigation or adapdation solution	Additional information and examples
Agriculture, Forestry, Other land uses and Fisheries	**Agriculture**	Sustainable crops, agro-forestry, livestock production	E.g., investments in crops that are more resilient to climate extremes and change
		Supply chain management (commercialization, primary processing, and storage)	
		Financial services for sustainable production, commercialization, storage, and processing	
	Forestry	Afforestation, Reforestation, Forest Conservation, sustainable management of existing forest, including extraction of non-timber products	
		Supply chain management (commercialization, primary processing, and storage)	
	Fisheries	Sustainable fish production	
		Supply chain management (commercialization, primary processing, and storage)	
	Food & diet	Food waste and low-carbon diets	
	Policy & National Budget Support & Capacity Building	NA	
	Unspecified / Multiple	NA	
Others & Cross-sectoral	**Policy & National Budget Support & Capacity Building**	NA	
	Biodiversity, Land & Marine Conservation	NA	
	Disaster-risk Management	NA	Ex. Integration of climate change scenarios and climate risk assessments into disaster-risk plans and preparedness
	Other/Unspecified	NA	

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