The State of Cities Climate Finance 2024

Methodology

September 2024

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CITIES CLIMATE FINANCE LEADERSHIP ALLIANCE

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1. INTRODUCTION

This Methodology Document provides additional detail on the methodology used to track urban climate finance flows and assess urban climate finance needs in the 2024 State of Cities Climate Finance Report (SCCFR). For its urban climate finance flows assessment, the SCCFR captures available data on primary financing supporting greenhouse gas (GHG) emissions reductions and climate resilience activities in cities for 2019, 2020, 2021, and 2022. The SCCFR also compiles underlying needs assessments to estimate the amount of urban climate finance needed for mitigation activities by 2030 and 2050 and includes a preliminary estimate of some urban adaptation costs by 2030 and 2050.

The SCCFR is prepared by the Cities Climate Finance Leadership Alliance (CCFLA) under the Secretariat of Climate Policy Initiative (CPI) and builds upon the climate finance tracking methodology developed for CPI's 2023 Global Landscape of Climate Finance (GLCF). More details on the 2023 GLCF Methodology can be found here.

This Methodology document is composed of the following sections:

- Definitions and Scope: provides an overview of the definition of urban climate finance, used primarily for tracking urban climate finance flows but also applicable to the needs assessment.
- Country Classification: details how countries are classified to determine domestic and international climate finance flows.
- Flow Tracking Methodology: details the key data sources, project-level, and capital expenditure estimation procedures used to compile 2019-2022 urban climate finance flows.
- Needs Assessment Methodology: an overview of the methodology used to compile urban climate finance needs by 2030 and 2050, including detailed information on the content of each mitigation sector covered and the adaptation estimates.

2. DEFINITIONS AND SCOPE

This section details the definition of cities and urban areas and urban climate finance used to guide the tracking and needs assessment for the SCCFR. For both flows and needs, CCFLA has adopted an operational definition of climate finance and a standardized accounting methodology from the GLCF (CPI 2023a) to ensure that data are comparable and consistent and that overlaps are avoided to the fullest extent possible.

2.1 FUNCTIONAL URBAN AREAS

Comparing cities or urban areas across regions and countries is challenging due to inconsistent national definitions and varying administrative boundaries. The SCCFR employs the concept of Functional Urban Areas (FUAs), which the OECD and the EU Commission developed. FUAs consider cities' economic and functional scope based on the daily movements of people to and from surrounding administrative units (OECD and European Commission 2020). They include areas relevant to a city's activity, such as peripheral residential or industrial areas. The FUA definition allows for focusing on climate finance flows to projects and activities within a city's administrative boundaries and those that extend beyond, considering their climate impact resulting from broader urban dynamics.

2.2 URBAN CLIMATE FINANCE

CCFLA's working definition of urban climate finance refers to financial resources directed at limiting city-induced GHG emissions and activities intended to address climate-related risks cities face.

This definition is adapted from the definition of climate finance developed by CPI (CPI 2023a) which is aligned with the recommended operational definition of the UNFCCC Standing Committee on Finance (UNFCCC SCF 2014; UNFCCC SCF 2016; UNFCCC SCF 2018; UNFCCC SCF 2020), which states: "Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing the vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts."

CCFLA applies the definition to urban climate finance for both tracking flows and assessing needs in the following ways:

- **Urban climate change mitigation** encompasses projects reducing or avoiding GHG emissions within a city's boundaries or GHG emissions resulting from activities occurring within the city. Mitigation activities also include maintaining or enhancing GHG sinks and reservoirs. This follows the Global Protocol for Community-scale GHG Emissions Inventories (GPC) approach, which offers cities a comprehensive greenhouse gas emission accounting framework and is used by cities reporting through the CDP-ICLEI Unified Reporting System (C40 et al. 2021).
- **Urban climate change adaptation** involves projects enhancing cities' adaptive capacity and resilience to climate-related risks directly impacting urban areas. For climate

adaptation, projects were included if they were located within city boundaries or aimed to address a climate risk faced by the city, depending on the type of activity.[1]

- **Dual benefits finance** as resources directed to activities contributing to both "urban climate change mitigation" and "urban climate change adaptation" and meeting the respective criteria for each category.

For each category above, investments meeting the criteria can range from information and knowledge generation, capacity development, and planning to implementation of actions/ investments.

1 Throughout the report we use the words "climate resilience finance" and "adaptation finance" interchangeably but acknowledge that differences exist between the two.

3. COUNTRY CLASSIFICATION

This section describes the regional breakdown adopted in the 2024 SCCFR to represent the destinations of climate finance flows (see Table 1). Flows are classified as 'transregional' when resources are channeled to more than one region.

Financial flows are categorized into domestic and international. Domestic flows pertain to climate finance that was raised and spent within the same country, while international flows pertain to climate finance flows that were raised in a specific country but spent in another.

COUNTRY CLASSIFICATION BY REGION

Table 1: Regional grouping used for the analysis of urban climate finance flows

Region	Country or territory
Central Asia & Eastern Europe	OECD[2]: Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Turkey. Non-OECD: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Georgia, Kazakhstan, Kosovo[3], Kyrgyz Republic, North Macedonia, Montenegro, Republic of Moldova, Romania, Russian Federation, Serbia, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan
East Asia & Pacific	Non-OECD: American Samoa, Brunei, Cambodia, China, Cook Islands, Democratic People's Republic of Korea, Fiji, Indonesia, Kiribati, Lao PDR, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Myanmar, Nauru, Niue, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Singapore, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Viet Nam
Latin America & Caribbean	OECD: Chile, Colombia, Costa Rica, Mexico Non-OECD: Anguilla, Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia (Plurinational State of), Bonaire, Brazil, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, St. Barthélemy, Sint Eustatius and Saba, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela (Bolivarian Republic of), West Indies
Middle East & North Africa	Non-OECD: Algeria, Bahrain, Egypt, Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, State of Palestine, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen
Other Oceania	OECD: Australia Non-OECD: New Zealand, Tokelau

2 The list of 38 members to the Organisation for Economic Co-operation and Development (OECD) can be found at https://www.oecd.org/about/.

3 This designation is without prejudice to positions on status and is in line with United Nations Security Council resolution 1244 and the International Court of Justice Opinion on the Kosovo Declaration of Independence.

Region	Country or territory
Sub-Saharan Africa	Non-OECD: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cabo Verde, Central African Republic, Chad, Comoros, Republic of Congo, Democratic Republic of the Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, São Tomé and Principe, Saint Helena, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, United Republic of Tanzania, Togo, Uganda, Zambia, Zimbabwe
South Asia	Non-OECD: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
US & Canada	OECD: Bermuda, Canada, United States of America
Western Europe	OECD: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom. Annex I Parties: Andorra, Liechtenstein, Malta, Monaco Non-OECD: San Marino, Vatican City

LEAST DEVELOPED COUNTRIES, EMERGING MARKETS, AND DEVELOPING ECONOMIES, DEVELOPED COUNTRIES

For the first time, the 2024 SCCFR adopted a high-level classification of countries based on income and development status (see Table 2), following the GLCF classification (CPI 2023a). The basis for the classification is the UN Statistics Division Standard Country or Area Codes for Statistical Use, also known as the M49 Standard (UNSD 2023) and the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2023). This covers geographical regions and, at the time of the literature cut-off date, identified developed regions, developing regions, and least developed countries (LDCs).

Table 2: Country development status classification used for the analysis of urban climate finance flows

Classification	Country or Territory
Least Developed Countries (LDCs)	Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Congo, Democratic Republic, Djibouti, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao PDR, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Tanzania, Timor-Leste, Togo, Tuvalu, Uganda, Vanuatu, Yemen, Zambia

Emerging Markets and Developing Economies (EMDEs)	Algeria, Antigua and Barbuda, Argentina, Armenia, Aruba, Azerbaijan, Bahamas, Bahrain, Barbados, Belize, Bolivia, Botswana, Brazil, Brunei, Cameroon, Cape Verde, Chile, China, Colombia, Congo Republic, Costa Rica, Côte d'Ivoire, Cuba, Ecuador, Egypt, El Salvador, Equatorial Guinea, Fiji, Gabon, Georgia, Ghana, Guatemala, Honduras, Hong Kong, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya,, Korea, Democratic People's Republic Korea, Kuwait, Kyrgyzstan, Lebanon, Libya, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Micronesia, Mongolia,, Morocco, Namibia, Netherlands Antilles, Nicaragua, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Puerto Rico, Qatar, Saint Helena, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Saudi Arabia, Seychelles, Singapore, South Africa, Sri Lanka, State of Palestine, Suriname, Swaziland, Syria, Taiwan, Tajikistan, Thailand, Trinidad and Tobago, Tunisia, Turkmenistan, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, Vietnam, Zimbabwe
Developed Countries	Albania, Andorra, Australia, Austria, Belarus, Belgium, Bermuda, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, European Union, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Jersey, Latvia, Lithuania, Luxembourg, North Macedonia, Malta, Mayotte, Moldova, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States of America

4. URBAN CLIMATE FINANCE FLOWS TRACKING METHODOLOGY

Our urban climate finance tracked investments are limited to primary capital flows directed toward low-carbon and climate-resilient development interventions with direct or indirect GHG mitigation or adaptation benefits for urban areas. These flows include support for capacity-building measures as well as for the development and implementation of policies. To determine what constitutes mitigation and adaptation finance provided by the public sector, we rely on the tracking methodologies and reporting followed by: i) the members of the OECD's Development Assistance Committee (DAC), data for which is publicly available through the Creditor Reporting System database;[4] ii) the group of Multilateral Development Banks (MDBs) and members of the International Development Finance Club (IDFC) reporting on climate finance;[5] and iii) the group of multilateral climate funds, as reported through the Climate Funds Update.[6]

This report builds on the previous 2021 SCCFR (CCFLA 2021). Box 1 describes key methodological improvements from the 2021 report and how they impact data comparability.

Box 1: Key methodological improvements since the 2021 SCCFR

Keyword list improvements: Sector-specific keyword list for every sector based on the revised urban climate finance taxonomy. A more comprehensive list of urban settlement names (increased from approximately 500 in the previous report to 12,000), with increased representation of low- and middle-income countries and inclusion of settlement names in local languages.

New project-level data sources: AidData's Global Chinese Development Finance Dataset and IJ Global.[7]

Capital expenditure methodology improvements: the transport and buildings sectors follow the previous SCCFR methodology but with review and expansion to include new technologies such as electric trucks or two-wheelers and heat pumps, respectively.

4 See (OECD 2011; OECD 2016; OECD 2021; OECD 2023a)
5 See (MDBs and IDFC 2015a; MDBs and IDFC 2015b; MDBs 2018; African Development Bank et al. 2019; African Development Bank et al. 2021; MDBs 2023)
6 See (ODI and HBF 2023)
7 IJ Global databases were used to gather information on primary financing for non-energy projects like water, waste, municipal infrastructure, power transmission and distribution, and low-carbon transport from corporations and financial institutions. See the Global Landscape of Climate Finance Methodology for more information on the databases (CPI 2023a).

4.1 GENERAL PRINCIPLES OF DATA COLLECTION AND REPORTING

Following an extensive data scoping exercise, datasets are intensively cleaned and processed following the GLCF principles (CPI 2023a). Where financing flows are detailed at the project level, data are checked manually for the consistency of information about actors, geographies, instruments, and sectors. Desk research complements the cleaning process where the datasets are incomplete. To ensure consistency and comparability in our data between the private and public sectors, we set and observe the following general principles when collecting and reporting the data.

- **Avoid double counting:** CCFLA's SCCFR tracks only those transactions representing new money targeting urban climate-specific outcomes. For instance, both private research and development for new technologies and investment in manufacturing for low-GHG and climate resilient development are excluded because, at the technology deployment stage, such costs are capitalized and factored in the investment amounts of new projects that implement these technologies, increasing the risk of double counting if the initial investment were to be tracked separately. Similarly, revenue support mechanisms such as feed-in tariffs reimburse the initial investment costs, so including them would constitute double counting. Thus, we do not track policy-induced revenue support mechanisms or other public subsidies[8] whose primary function is to pay back initial investment costs.

  Significant overlaps between datasets mean that the same flows are recorded several times. During the consolidation phase, we rank sources of duplicate flows according to reliability and comprehensiveness, selecting only the highest quality entry for each overlapped transaction in order to avoid double counting. To avoid double counting between project-level data and capital expenditure estimates, we excluded the latter and retained the more granular entries when both covered the same activities. This was done by removing the exact corresponding quantity by sub-sector types (e.g., railways) and the same country or geographical regions in the capital expenditure estimates.

- **Track primary investment:** The SCCFR captures total primary financial transactions and investment costs or, where tracked, components of activities that directly contribute to adaptation and/or mitigation, plus public framework and capacity development expenditures (e.g., development of national climate strategies). Secondary market transactions (e.g., re-selling of stakes or public trading on financial markets) are not tracked because they do not represent new investments targeting climate-specific outcomes but rather money being exchanged for existing assets.

- **Exclude carbon emissions lock-in:** Investments and expenditures captured in the SCCFR do not capture investments that have a high risk of locking in significant future GHG emissions. Based on this principle, fossil-fuel-based, lower-carbon, and energy-efficient generation transactions, such as financing for efficiency retrofits of coal-fired power plants, are excluded.

8 Note that public subsidies for EVs are included as an exception. For further details, please refer to "Electric Vehicles" under "Assumptions" section of the GLCF methodology (CPI 2023a).

- **Maximize granularity:** wherever possible, CCFLA uses project-level data to check and select flows. Project-level information is more likely to provide verifiable details on project characteristics, instruments, destinations of financing, and financing structures. Where project-level data are not available or insufficiently complete for inclusion, aggregated data are used.
- **Include tangible financial commitments:** The figures reported in the SCCFR represent financial commitments made during the period being tracked. Depending on the context (e.g., a public commitment by a government versus a private financing contract agreed between corporate actors), commitments may refer to firm obligations by means of Board decisions on investment programs, closure of financing contracts, or similar actions. Such commitments are backed by the necessary funds to provide specified assistance/financing to a project, recipient country, or any other partner organization. Financial resources committed record the amount of expected transfer at the time the contract was closed or the commitment otherwise established, irrespective of the time required for the completion of disbursement. It is important to note that we only track financial commitments from the institutions financed through their own funds and exclude any external funds managed and/or implemented by the institutions.
- **Err toward conservativeness:** When faced with insufficient details, CCFLA takes a conservative approach and prefers to under-report rather than over-report urban climate finance.

4.2 SCOPE OF ACCOUNTING OF URBAN CLIMATE FINANCE FLOWS

The SCCFR methodology for tracking urban climate finance flows uses the following definitions for finance providers (public and private) and financial instruments.

4.2.1 PUBLIC CLIMATE FINANCE FLOWS

The SCCFR urban climate finance flows include investment flows from the following public sources:

- **Development Finance Institutions (DFIs),** including:
  - Multilateral and regional, where the institution has multiple shareholder countries and directs finance flows internationally.[9]
  - Bilateral, where a single country owns the institution, and it directs finance flows internationally.
  - National, where a single country owns the institution and finance is directed domestically. They are distinct from state-owned financial institutions (SOFIs) in that they have a specific development mandate in their operations.

9 Climate finance from multilateral Development Finance Institutions (DFIs) is proportionally broken down according to the ownership shares of the participating member states. In SCCFR21, climate finance from multilateral DFIs was automatically categorized as international flows. Additionally, the flows' country of origin were categorized as "transregional."

- **National Governments,** including:[10]
  - Bilateral climate-related development finance reported to the OECD-DAC Creditor Reporting System (OECD, 2023) to track Official Development Assistance and Other Official Flows.[11]
  - Domestic financing through public budgets carried out by central governments and their agencies.
- **Multilateral and national climate funds.** We only include commitments from DFIs' own resources. We exclude the following to avoid double counting: external resources that DFIs manage on behalf of third parties; governments' contributions to DFIs or Climate Funds; bilateral Climate Funds' commitments; DFIs' contributions to projects reported by Bloomberg New Energy Finance (BNEF 2023a)
- **State-owned enterprises (SOEs) and SOFIs**. We classify institutions as state-owned if they are at least majority owned by a government or government agency.
- **Public funds**: institutional investors managing funds under public ownership.

4.2.2 PRIVATE CLIMATE FINANCE FLOWS

We categorize private investors as follows:

- **Corporations**, which can have activities in all sectors and merge project developers and corporate actors.
- **Households/individuals**, i.e., family-level economic entities, including high-net-worth individuals and their intermediaries (e.g., family offices investing on their behalf).
- **Commercial financial institutions**, i.e., providers of private debt capital (and occasionally other instruments), including commercial and investment banks.
- **Institutional investors**, including insurance companies, asset management firms, pension funds, foundations, and endowments.
- **Funds**, including private equity, venture capital, and infrastructure funds.

4.2.3 FINANCIAL INSTRUMENTS DEFINITIONS

The 2024 SCCFR urban climate finance flows capture the following financial instruments:

- **Grants**: Transfers made in cash, goods, or services for which no repayment is required.
- **Project-level debt**: Debt relying on a project's cash flow for repayment.

10 SCCFR 2024 estimates include only national government climate finance due to a lack of data availability on local or subnational public budgets.

11 Our estimate captures the portion of bilateral climate-related development finance reported in the OECD's DAC Creditor Reporting System (CRS) qualifying as Official Development Assistance or Other Official Flows in 2019,2020 and 2021. The lower bound of our figures includes finance marked as having 'climate change mitigation' or 'adaptation' as its 'principal' objective. The upper bound includes activities with a 'significant' climate change objective. In the case of activities marked both as mitigation and adaptation, we attributed related financing to the use marked as 'principal'. Due to lack of data for 2022, we assumed that bilateral climate finance commitments were the same amount as in 2021.

  - *Low-cost debt* refers to loans extended at terms preferable to those prevailing on the market. We count the full amount of the loan, not the grant equivalent.
  - *Market-rate debt* refers to loans extended at regular market conditions. Examples include (but are not limited to) term loans, credit facilities, bridge loans, and mezzanine debt.
- **Project-level equity**: Equity investment for an ownership stake and share of profits.
- **Balance sheet financing**: Direct debt or equity investment by a company or financial institution.[12]

We acknowledge the importance of risk management instruments like guarantees and insurance in enabling increased private climate flows, particularly in areas and sectors with low-risk appetites for private investment. However, following the principle of conservatism, we exclude these instruments from the total climate finance figure because actual disbursements from these instruments are contingent upon uncertain future events. Guarantees are only exercised in particular circumstances, and there is a chance of there never being any financial outflow from the guarantor.[13]

4.2.4 KEY DATA SOURCES

The SCCFR consolidates data from a wide range of primary and secondary sources. It follows financial flows along their lifecycles, from the original source of financing, through financial intermediaries, their deployment in the form of financial instruments, and the recipients of finance, to how finance is ultimately used on the ground. The SCCFR uses consolidated data from the GLCF series (CPI 2022; CPI 2023b) complemented by additional project-level data collection and capital expenditure estimations (see Table 3 for breakdown of SCCFR data sources between GLCF and other sources).

Table 3: Tracked urban climate investments sources breakdown

Source	2019/2020	2021/2022
Global Landscape of Climate Finance	USD 103.8 billion	USD 324.4 billion
Other sources	USD 437.1 billion	USD 506.1 billion
Total	USD 540.9 billion*	USD 830.5 billion*

Note: Totals may not exactly match the sum of the reported figures due to rounding adjustments.

12 The share of climate finance allocated to different categories of financial instruments may not fully reflect reality, as our categorization is based on the quality of the data sources available.
13 We acknowledge that risk management instruments are accounted by other organizations producing, collecting, aggregating, and publishing data on climate finance flows, including the group of MDBs jointly reporting on climate finance, and the OECD.

Data for urban climate finance was sourced from the 2022 and 2023 Global Landscape for Climate Finance reports (CPI 2022; CPI 2023b), among other sources. These sources include the OECD-DAC Creditor Reporting System database, World Bank Public-Private Infrastructure data, Bloomberg New Energy Finance, Climate Funds Update, and surveys conducted with development finance institutions (DFIs). Unlike the previous report (CCFLA 2021), this edition also incorporates additional data from AidData's Global Chinese Development Finance Dataset and IJ Global (see Table 4 for a list of the main data sources used for the analysis). While we make every effort to ensure the consistency of the data reported in the SCCFR, we do not audit or verify data providers' application of urban climate finance definitions, and we rely on the reporting provided.

Table 4: List of main data sources used for the analysis of urban climate finance flows

Data source	Description	Finance Source / Sector	Data Granularity	Approach
AidData Global Chinese Development Finance (AidData 2023)	AidData's granular dataset of international development finance from China, which captures projects across low- and middle-income countries financed with grants and loans.	International public finance/ all sectors	Project-level	Keyword search
Bloomberg New Energy Finance (BNEF 2023a)	Asset finance database for grid-connected renewable energy, as well as off-grid solar.	International and domestic private finance/ electricity generation	Project-level. See GLCF methodology (CPI 2023a) for assumptions.	Keyword search
BNEF Small-scale solar (BNEF 2023b)	Residential and commercial solar PV projects with capacity less than 1MW.	International and domestic private finance	Aggregated. See GLCF methodology (CPI 2023a) for assumptions.	Used for Energy Systems Capital Expenditure Estimations
Climate Bonds Initiative	Proprietary data on primary investment in climate projects in post-issuance reporting.	Domestic public and private finance/ all sectors	Project-level. See GLCF methodology (CPI 2023a) for assumptions.	Keyword search
Climate Funds Update (ODI and HBF 2023)	Data on bilateral and multilateral Climate Funds' commitments.	International public finance/ all sectors	Project-level	Keyword search

DFI Surveys	Surveys were sent to DFIs for them to report their urban-relevant climate finance.	International public finance/ all sectors	Project-level	Data provided by 6 DFIs were urban tagged, and for 42 DFIs a keyword search was performed
IEA proprietary data on EV Charging	IEA provided the split between public and private electric vehicles charging stations by country.	Domestic Finance/ Transport	Aggregated. See GLCF methodology (CPI 2021) for assumptions.	Used for Transport Capital Expenditure Estimations
IEA proprietary data on EV Investment	Through collaboration with the IEA, this dataset was constructed through desk research to identify country-level retail prices of all commercially available models of battery EVs, combined with annual sales data by country.	Domestic finance/ Transport Sector	Aggregated. See GLCF methodology (CPI 2023a) for assumptions.	Used for Transport Capital Expenditure Estimations
IJGlobal (IJGlobal 2023)	IJ Global databases were used to gather information on primary financing for non energy projects like water, waste, municipal infrastructure, power T&D, and low-carbon transport from corporations and financial institutions.	International private and public finance; energy, transport and water and wastewater	Project-level. See GLCF methodology (CPI 2023a) for assumptions.	Keyword search
OECD (OECD 2023a)	The OECD DAC Credit Reporting System (CRS) provides data on international project and market support from bilateral and multilateral donors.	International public finance/ all sectors	Project-level. See GLCF methodology (CPI 2023a) for assumptions.	Keyword search
World Bank PPI (World Bank 2024a)	The Private Participation in Infrastructure (PPI) Project Database has data on infrastructure projects in low- and middle-income countries.	Domestic private and public finance/ all sectors	Project-level	Keyword search
IEA Solar Heating and Cooling Programme (IEA SHC 2020; IEA SHC 2021; IEA SHC 2022; IEA SHC 2023)	Household, corporate, and government investments in solar water heating systems, estimated based on cost and capacity additions data from IEA SHC.	Domestic finance/ Buildings Sector.	Aggregated. See GLCF methodology (CPI 2023a) for assumptions.	Used for Buildings Capital Expenditure Estimations

4.3 PROJECT-LEVEL FLOWS ESTIMATIONS

4.3.1 PROJECT-LEVEL ESTIMATIONS METHODOLOGY

We filtered the datasets above to "tag" urban climate finance by determining which projects met our criteria for urban climate finance.[14] We used keyword lists (matching keywords against each project's name and description) to tag and then conducted additional manual reviews to confirm urban inclusion.[15]

We used four distinct keyword sets; projects were included if they matched with at least one of the inclusion keyword lists and did not match with the exclusion list.

1. **Urban Generic Inclusion Keywords:** This list included general urban-related terms such as "urban," "cities," "metropolitan," and others.
2. **Sector Specific Inclusion Keywords:** This list contained keywords specific to each project's sector. For instance, in the energy sector, "district heating" would qualify as urban, while "offshore wind farms" would not, as the latter are generally located outside urban areas due to space requirements and provide energy not only to cities.
3. **City Names List:** Approximately 12,000 administrative city names were used to identify projects located within urban boundaries.[16] This list was made up of combining city names sourced from the following inputs:
   - An FUA dataset developed by the OECD, which includes 1,400 cities and any adjacent municipalities with high social and economic integration with the urban core (OECD 2023b).
   - Additional spatial analysis of the Global Administrative Areas (GADM) dataset (University of California 2022) to avoid overrepresentation of high-income countries. This analysis identified highly urbanized settlements at the municipal level by overlaying GADM data with Global Human Settlements (GHS) degree of urbanization raster data, similar to the OECD's FUA methodology and based on previous CCFLA methods.[17]
   - Simple Maps World Cities Database (SimpleMaps 2024). We included this to account for inconsistencies from varying territorial administrative boundaries and urban settlements prediction errors from spatial resolution. We included cities with populations equal to or above each country's national average city size.
   - An additional list of Chinese cities (Swerts 2017) was included given their importance to the energy sector and their unique administrative territorial system. We included Chinese cities at the administrative "County" and "Prefecture" levels, as this best met our urban criteria. We pro-rated Prefecture-level projects to account for rural territories using the national urban population proportion (60%).[18]

14 If datasets were already urban tagged by the provider (as was the case for DFI surveys in Table 4) we did not perform additional urban tagging.
15 Projects valued at over USD 1 billion were individually analyzed to ensure urban relevance according to the taxonomy. Additionally, the projects above the 50th percentile in each sector were also manually reviewed. In the case of conflict, the manual revision was prioritized over keyword tagging.
16 Special attention was given to developing the cities list to ensure it adhered to the Functional Urban Area (FUA) definition (OECD 2012; OECD 2019; European Commission 2021) and did not overrepresent high-income countries.
17 See the report "Accelerating Urban Climate Finance in Low- and Middle-Income Countries" (CCFLA 2023).
18 60% urban population based on average of different studies (UN-DESA 2018) (Huang et al. 2019) (Harrell 2023).

4. **Non-Urban Exclusion Keywords:** This list contained non-urban terms (e.g., "village") and terms that could lead to mismatches (e.g., "Paris Agreement") to avoid incorrect categorization of projects not occurring within urban areas. Projects matching this list were excluded.

4.4 CAPITAL EXPENDITURE ESTIMATIONS FOR TRANSPORT

The 2021 SCCFR developed a methodology for estimating transport capital expenditures in urban climate finance covering the years 2017-2018 (CCFLA 2021). This SCCFR used this methodology to cover the years 2019-2022 and expanded upon the previous approach to improve coverage. The capital expenditure approach is based on the mode of transport; first, we identify the number of vehicles sold in 2019-2022 and the amount of relevant new infrastructure added in those years and estimate finance based on the identification of relevant unit costs. Unit costs will vary around the world, and conservative estimates were used wherever possible.

We have not been able to find any information to help us estimate urban adaptation investments in the transport sector. Transport adaptation investments are primarily important for transport infrastructure; within the SCCFR taxonomy, this could entail infrastructure for railways, buses, cycleways, electric vehicle recharging infrastructure and hydrogen vehicle refuelling, as well as other urban infrastructure that supports clean, public, and active travel in urban areas. For such infrastructure, "adaptation" considerations would usually be built when the infrastructure is refurbished, or when new infrastructure is constructed. In refurbishment cases, the relevant investment could be captured by identifying investment in the maintenance and rehabilitation of existing infrastructure. However, we were unable to identify these costs for this report.

Table 5: Methodology for transport capital expenditure estimates calculations

TRANSPORT AREA	METHODOLOGY AND RATIONALE
Railways	**For railway investment, we focused on identifying clear urban investments: specifically, investment in metro and light rail/tram infrastructure and vehicles. The proportion of 'heavy' rail that is within an urban area could not be estimated in a consistent manner, and is only identifiable on a case-by case basis.**
New metro infrastructure	1. Identification of the length of lines opened in 2019-2020 from (UITP 2022), which included regional breakdowns from 2013 to 2020. The figures for 2021 and 2022 were obtained by taking the average from 2017-20, as this covers the scope of SCCFR21 and SCCFR24 investment flows period, rather than selecting the timeframe at random. This is a conservative approach, as it gives a value less than the actual values in 2020 and 2019 for 2021 and 2022, whereas the amount of metro infrastructure added annually has increased compared to the previous year for all but one year since 2014.

TRANSPORT AREA	METHODOLOGY AND RATIONALE
	2. The costs per km of new metro were taken from an Institute for Transportation and Development Policy (ITDP) guide on bus rapid transit (BRT) (ITDP 2018) as they were for SCCFR21, although the values were increased by inflation (as the original figures were in 2013 USD). Unit costs take account of all elements of the infrastructure that are needed, e.g. metro stations and the means of delivering the electricity to the vehicles, so additional estimates for these were not included. Conservative cost estimates were taken by using the unit costs for tracks from the ITDP's estimates of costs for lower-income countries. 3. Overall estimated expenditure for metro railway infrastructure determined by multiplying the length of lines by unit costs.
New tram infrastructure	1. Identification of the length of lines opened in 2019-2021 from (UITP 2023), which included regional breakdowns. Similarly as for metro above, data on all years of interest were not publicly available so the 2022 figure was estimated by taking the average from 2017-20, as this covers the scope of SCCFR21 and SCCFR24 investment flows period, rather than selecting the timeframe at random. 2. The costs per km of new tram lines were taken from an ITDP guide on bus rapid transit (BRT) (ITDP 2018), as they were for SCCFR21, although the values were increased by inflation (as the original figures were in 2013 USD). Unit costs take account of all elements of the infrastructure that are needed, e.g. tram stations and the means of delivering the electricity to the vehicles, so additional estimates for these were not included. Conservative cost estimates were taken by using the unit costs for tracks from the ITDP's estimates of costs for lower-income countries. 3. Overall estimated expenditure for metro railway infrastructure was determined by multiplying the length of lines by unit costs.
New metro vehicles	1. The number of new additional metro vehicles was estimated from UITP, which cites an average of eight cars per km of metro line (UITP 2022). This figure was applied to the number of new metro lines added each year to estimate the number of additional cars that were needed each year. This conservative approach does not consider the replacement of existing fleets. 2. The unit cost of new metro cars was based on the lower cost estimates from several sources, which were compared with the values used for SCCFR21 as a sense check. 3. Overall estimated expenditure for new urban metro vehicles was determined by multiplying the number of new metros by unit costs.
New tram vehicles	1. The number of new additional LRT vehicles was estimated from UITP, which cites a global average of 1.2 vehicles per km (UITP 2023). This conservative approach does not consider the replacement of existing fleets. 2. The unit cost of LRT vehicles was based on the lower cost estimates from several sources, which were compared with the values used for SCCFR21 as a sense check. 3. Overall estimated expenditure for new urban tram vehicles was determined by multiplying the number of new trams by unit costs.
Retrofitting diesel locomotives or railcars with electricity, battery electric or hydrogen	**Not estimated:** Retrofitting will largely be undertaken on a project-by-project basis, so it is challenging to comprehensively identify investment levels. Retrofitting is more relevant for heavy rail, as metros and trams tend to be electric, although heavy urban rail is not covered, as mentioned above. However, as battery electric and hydrogen technology for trains are still relatively new, this likely represents a small gap.

TRANSPORT AREA	METHODOLOGY AND RATIONALE
Waterways	**We could not estimate investment in urban transport for waterways due to a lack of comprehensive information. Few new ferries are procured annually, and even fewer of these would operate on electricity or hydrogen, as both are relatively new technologies for ferries. Given the small number of cities that use waterways for either passenger or freight transport, and the small proportion of transport undertaken on these modes compared to rail and bus in cities, it is unlikely that investment in urban waterway transport will be a significant source of climate-aligned investment, either now or in the future.**
Buses	**We focused on new electric and hydrogen vehicles, their recharging and refuelling infrastructure, and BRT infrastructure. We faced challenges around identifying investment in the relevant part of inter-urban bus transport, the operation of buses and their retrofit. We therefore could not estimate investment for other taxonomy items, such as retrofitting and operation. We included investment in electricity and hydrogen recharging infrastructure under 'Private Vehicles', as we could not break this down by mode.**
New electric buses	1. The number of new electric buses was taken from IEA Global EV Data Explorer (IEA 2024). 2. Unit cost of an electric bus was estimated from a combination of reports which had broad agreement on a unit value in Asia, which accounts for most electric bus sales. 3. We kept the assumption from SCCFR21 that 90% of electric buses were used in urban areas, still supported by (IEA 2023a): *"the vast majority of electric buses in China (and elsewhere) are currently used in urban public transit operations, but official statistics show that at least 8% of new energy buses are operating on intercity routes".* 4. Overall estimated expenditure for new urban electric buses was determined by multiplying the number of new electric buses by unit costs and by the share of urban electric buses.
New hydrogen buses	1. The number of new hydrogen buses was taken from relevant IEA reports (IEA 2020a; IEA 2021a; IEA 2022a; IEA 2023a). 2. The unit cost of a hydrogen bus was estimated from a combination of reports which had broad agreement on a unit value in Asia, which accounts for most sales. 3. We assumed that 90% of hydrogen buses were used in urban areas, as with electric buses above. 4. Overall estimated expenditure for new urban hydrogen buses was determined by multiplying the number of new hydrogen buses by unit costs and by the share of urban hydrogen buses.
Trolleybuses	Trolleybuses are included in the IEA's figures for electric buses.[19]
New BRT infrastructure	1. The length of BRT systems installed each year was available from an online database (UITP 2024), from which we split the length of newly installed BRT by region. 2. The same database includes cost figures for some projects. An average was taken of the cost per km over 2017-2022.

19 Investment in trolleybuses may already be covered in the electric bus figures presented above as these are effectively electric buses served by overhead cables. While the IEA's EV reports are not explicit about whether their figures for electric buses include trolleybuses, the (IEA 2020a) report includes a reference to the roll-out of electric buses in Mexico City, which are clearly (from the reference) trolleybuses. Hence, the implication is that the IEA's figures for electric buses – which have been used for the estimates of investment mentioned above – include investment in trolleybuses. As with battery electric buses, there is increasing interest in trolleybuses, because of their potential benefits in reducing emissions, as well as the developments in electric vehicle technology. In a brief on buses (UITP 2019) trolleybuses make up a relatively small proportion of the existing bus fleet globally, i.e. 1.7%.

TRANSPORT AREA	METHODOLOGY AND RATIONALE
	3. It is assumed that all the investment in BRT systems worldwide is in urban areas. However, not all this infrastructure will be used by electric buses. According to the (UITP 2019), around 9.3% of the global bus fleet in 2019 was electric. Hence, we have assumed that 10% of the global BRT infrastructure will be used by electric vehicles, so have included 10% of total BRT investment. 4. Overall estimated expenditure for new BRT infrastructure was determined by multiplying the length of new BRT systems installed by unit costs and by the share of infrastructure used by electric BRT.
Electric and hydrogen bus recharging points	We could not separate out investment in new recharging infrastructure for electric and hydrogen buses from the overall investment in electric and hydrogen vehicle recharging infrastructure. These investments are instead captured in electric and hydrogen vehicle recharging infrastructure under 'private road vehicles' (see below).
Retrofitting diesel buses with battery electric or hydrogen	**Not estimated:** As with retrofitting electric and hydrogen technology to rail, retrofitting for buses will largely be undertaken on a project-by-project basis, so we could not estimate investment levels. In addition, retrofitting is more likely to involve retrofitting diesel vehicles with CNG technology, rather than with electric or hydrogen technology, as the latter will require more significant changes to a vehicle. This is therefore likely a small level of investment.
Private road vehicles	**Data on the number of new electric and hydrogen cars, vans, trucks, two- and three-wheelers, as well as new recharging and refuelling infrastructure, was sourced from relevant IEA reports. These reports included breakdowns by region and some unit cost information. We were unable to comprehensively estimate retrofitting of private vehicles as this will generally be done by individuals or within companies on a project-by-project level. Additionally, retrofitting petrol or diesel vehicles to LPG or CNG does not meet our climate finance criteria.**
Electric cars	1. Figures for global sales of electric cars, tracked in the GLCF using IEA data with detail on geographic, types of finance providers as well as financial instrument breakdowns (CPI 2022; CPI 2023b), were used. 2. We assumed 90% of these electric cars as urban investments. We assumed this in line with buses, as discussed above, as we could not find further information on the likely proportion of electric that should be classified as urban investments. This follows the SCCFR21 approach which used 90% based on evidence from the UK and Norway. 3. Overall estimated expenditure for electric cars was determined by multiplying global sales by the proportion of urban electric cars.
Electric vans	1. The sales volumes of light commercial vehicles (LCVs) were taken from the Global EV Data Explorer (IEA 2024), together with the regional breakdown of sales. 2. We assumed that an LCV has the same price as a passenger car. The IEA reports did not provide the same level of detailed information for the average cost of an electric van. We identified model prices available on the market and these aligned broadly with the average cost of passenger cars. 3. We assumed 90% of these electric vans as urban, in line with electric cars (see above). 4. Overall estimated expenditure for electric vans was determined by multiplying global sales by unit costs and then by the proportion of urban electric vans.

TRANSPORT AREA	METHODOLOGY AND RATIONALE
Hydrogen cars	1. The sales volumes of Fuel Cell Electric (FCE) passenger cars were taken from the (IEA 2022b). 2. Two main hydrogen car models dominate the market and are priced similarly: the Toyota Mirai and Hyundai Nexo. We used the price of these models to estimate the investment in these vehicles. 3. We assumed 90% of these hydrogen cars as urban, in line with electric cars (see above). 4. Overall estimated expenditure for hydrogen cars was determined by multiplying global sales by unit costs and then by the proportion of urban hydrogen cars.
Hydrogen vans	The sales volumes of FCE LCVs were low, so the estimation of investment in these was included in that for FCE cars using same assumptions.
Electric trucks[20]	1. The sales volumes of electric trucks were taken from the Global EV Data Explorer (IEA 2024), together with the regional breakdown of sales. 2. A literature review found the price of the typical electric truck sold in the world's largest market: China, representing 90% of volume sales in 2021. This value was taken as the cost of an electric truck. 3. We assumed that 90% of electric trucks were urban, in line with electric buses (see above). 4. Overall estimated expenditure for electric trucks was determined by multiplying global sales by unit costs and then by the proportion of urban electric trucks.
Hydrogen trucks[21]	1. Annual sales have been calculated based on information found in a combination of IEA reports (IEA 2020a; IEA 2021a; IEA 2022a; IEA 2023a). 2. No information on the cost of hydrogen trucks could be found. However, the majority (99%) of fuel cell trucks are in China. We assumed that the cost is in line with that of hydrogen buses. 3. We assumed that 90% of hydrogen trucks were urban, in line with electric buses (see above). 4. Overall estimated expenditure for hydrogen trucks was determined by multiplying global sales by unit costs and then by the proportion of urban hydrogen trucks.
Two- and three-wheelers	1. The sales volumes of electric two- and three-wheelers were taken from various IEA Global EV Outlook reports (IEA 2020a; IEA 2021a; IEA 2022a; IEA 2023a). 2. The price of an electric two-wheeler was taken from a 2023 market report (GlobeNewswire 2023), which provided average prices for the years of interest. The price of an electric three-wheeler, the majority of which are sold in India and China, was taken from a market review of best sellers and then taking an average of their prices (ProReview 2023 Aug 3). 3. We assumed that 90% of electric two- and three-wheelers are urban, as with other private vehicles. 4. Overall estimated expenditure for two- and three-wheelers was estimated by multiplying the estimate of global sales by unit costs and then by the proportion of urban two- and three-wheelers.

20 Category was not included in SCCFR21 and is new for SCCFR24 transport estimates.
21 Category was not included in SCCFR21 and is new for SCCFR24 transport estimates.

TRANSPORT AREA	METHODOLOGY AND RATIONALE
Electric vehicle recharging infrastructure	1. Similarly to electric vehicles, we used figures tracked in the 2022 GLCF (CPI 2022) using IEA data with details on geographic types of finance providers as well as financial instrument breakdowns (CPI, 2022). This approach covered only the years 2019-2020, as the 2023 GLCF (which covers 2021-2022) did not have estimates for recharging infrastructure (CPI 2023b). 2. For the years 2021-2022, volumes of public slow and fast chargers have been calculated using annual stock numbers presented in two IEA Global EV Outlook reports (IEA 2022a; IEA 2023a). These reports also contained information on the regional breakdown of public slow and fast charging infrastructure, which enabled the estimation of investment in these by region. 3. For the years 2021-2022, the cost of public slow and fast chargers has been obtained from (PwC 2021a). 4. For all years, we assumed 90% 'urban', the same figure for electric cars (see above). 5. Overall estimated expenditure for electric vehicle recharging infrastructure was determined by multiplying the number of chargers by unit costs and then by the proportion of urban infrastructure.
Hydrogen refueling infrastructure (all vehicles)	1. Volumes of hydrogen refueling stations have been calculated using annual stock numbers presented in three IEA Global EV Outlook reports (IEA 2020a; IEA 2022a; IEA 2023a). 2. No updated values were found for the cost of installations of hydrogen refueling infrastructure. The same assumptions for SCCFR21 were used. 3. We assumed 90% 'urban', the same figure for hydrogen cars (see above). 4. Overall estimated expenditure for hydrogen refueling infrastructure was estimated by multiplying the number of refueling stations by the unit's costs and then by the proportion of urban hydrogen cars.
Non-motorized transport	**We focused on identifying investment in non-motorized vehicles, both electric and person powered. We could not identify investment in walking and cycling infrastructure improvements as these are often smaller scale, difficult to monitor, and included in larger schemes (e.g. road or urban development).**
Bicycles, electric bicycles, and electric micro-mobility vehicles	1. Global market values were identified for 2019-2022. Average values for each year were based on values contained in several reports. A regional breakdown based on a market report (PwC 2021b) has been applied to the values estimated for this report. 2. We kept the estimates from SCCFR21, which determined that 25% of the global bike market is for urban transport. This is in line with updated research, which suggested the urban share of the overall market ranged from 23% to 30%, depending on the sources.
Dedicated cycle lanes Cycle parking Pedestrian infrastructure	• Infrastructure for cycling includes cycling lanes and cycling parking facilities, which range from a few cycle racks to dedicated cycle parking that contains hundreds of racks. While it is possible to identify projects that have been completed and their costs, scaling these up to a global finance figure was not possible. • Estimating the finance for infrastructure for pedestrians was also not possible. Pedestrian infrastructure is often provided as part of larger transport schemes. • However, for 12 months of the four-year period covered by this report, the European Cyclists Federation (ECF) did monitor the implementation of additional cycle lanes in Europe during the Covid pandemic (ECF 2021a). The length of new cycling routes identified by the ECF was combined with the cost of one kilometer of such infrastructure – obtained from another ECF report (ECF 2021b) - to private a partial estimate of investment in new cycling infrastructure.

4.5 CAPITAL EXPENDITURE ESTIMATIONS FOR BUILDINGS AND INFRASTRUCTURE

Expenditure on climate mitigation and adaptation in urban buildings encompasses incremental capital outlay for acquiring physical assets such as high-performance structures and durable goods, as well as investments in energy-efficient appliances and climate-friendly practices. This includes expenditures on capacity-building activities and the development and implementation of policies and measures.

This section evaluates spending on climate mitigation in urban residential, commercial, and public buildings, categorized as urban-relevant when physically located within urban area boundaries. In contrast, industrial buildings are generally categorized under the industrial sector. Activities related to water and waste management within buildings typically fall under the "water" and "waste" sectors, respectively. Climate mitigation efforts in urban buildings specifically refer to initiatives that enhance these buildings' capabilities to reduce greenhouse gas emissions (Rosenzweig et al. 2018).

Where feasible, we disaggregated expenditures regionally to delineate finance providers, instruments utilized, and specific measures employed. These measures encompass energy efficiency enhancements in new and existing buildings, efficiency improvements in appliances, office equipment, and commercial processes, as well as installations of renewable heat and heat pumps within buildings. We followed the methodology developed for capital expenditure of buildings and infrastructure in SCCFR21, which aligns global and regional data with technology-specific information to ensure comprehensive coverage, with minor changes due to new data and taxonomy changes.[22]

In general, the methodology consists of two steps, customized for each region and type of technology (see Table 6 for more detailed assumptions for each region and type of technology):

1. **Identify buildings-related expenditure**: The expenditure figures for urban buildings for 2019-2022 are based on estimates provided by IEA's World Energy Investment 2023 (IEA 2023b) for energy efficiency (BNEF 2022a) for heat pumps, as well as solar water heaters (IEA SHC 2023). The IEA's estimates were structured in four geographical jurisdictions: China, Europe, USA, and Other (the rest of the world), and our estimates followed this structure. BNEF and IEA SHC reported the estimates for several individual countries, and we arranged this around the IEA breakdown
2. **Disaggregate expenditure into urban, technology, finance sources, and instruments:** We disaggregated estimates into urban or rural based on data from the census, publications, interviews, and our definition of urban climate finance. Urban figures are then broken down into types of technology, finance providers, and instruments.

22 Changes in SCCFR24: included heat pumps; excluded biomass due to lack of data availability; moved renewable energy from buildings to the energy sector due to taxonomy changes.

Table 6: Methodology for buildings & infrastructure capital expenditure estimates calculations

Region	Methodology & Rationale
China	**Energy efficiency:** 1. Take China's incremental buildings' energy efficiency investment from the IEA's World Energy Investment (IEA 2023b). 2. Determine urban share, assuming urban is 90% of investment: although the urban/rural population is 45%/55% (UN-DESA 2018), nearly the whole potential is being realized in cities (Zhou et al. 2018) due to the dedicated support of public support programs as well as a very high income difference between urban and rural households (150%-200%) (National Bureau of Statistics of China 2019). 3. Break down the investment into i) construction of new buildings, ii) retrofit of existing buildings, and iii) energy efficiency of appliances/equipment/lights. The first was calculated by multiplying the new floor area, the share of green buildings in it, and a representative estimate of incremental costs of green buildings (Berkelmans and Wang 2012; Mohurd 2019; Sun et al. 2019; Shen and Faure 2021). Retrofit investment was estimated from the ratios between volumes of loans for construction of new buildings and retrofit of existing buildings issued by banks. We assumed that expenditures on the purchases of appliances/equipment/lights could be calculated by subtracting the investments in new building construction and retrofit of existing buildings from the total volume spent on energy efficiency in the buildings sector. 4. To determine providers and instruments, we broke down the construction and retrofit investment using (GIZ/Felicity 2020). The investment in energy efficiency of appliances/equipment/lights is assumed to flow fully from household self-finance (balance sheet equity portion). **Solar Water Heaters:** 1. Based on the solar water heaters' capacity additions and cost data from the International Energy Agency Solar Heating and Cooling Programme (IEA SHC 2020; IEA SHC 2021; IEA SHC 2022; IEA SHC 2023), with applied country-level inflation rates (World Bank 2023a) we calculated country-level investment for solar water heaters. See GLCF Methodology for more details (CPI 2023a). 2. Take China's investment in solar water heaters and break it down into urban and rural, assuming urban is 70% of the investment (Huang et al. 2019). 3. Break it down into finance providers and instrument (GIZ/Felicity 2020), as done within energy efficiency due to limited data availability. **Heat pumps:** 1. Take China's spending on heat pumps (BNEF 2022a). 2. Break it down into urban and rural, assuming urban is 80% of the investment (Building Energy Research Center of Tsinghua University 2024). 3. Break it down into finance providers and instruments (GIZ/Felicity 2020), as done within energy efficiency due to limited data availability.

Region	Methodology & Rationale
Europe	**Energy efficiency** 1. Take Europe's incremental buildings' energy efficiency investment from IEA's World Energy Investment (IEA 2023b). 2. Determine urban share, assuming urban is 75% of investment. This is because urban buildings contribute 72% to the total European building stock (European Commission 2016), an income difference between urban and rural populations is relatively low (urban households in the EU have, on average, 20% higher disposable income than rural households). 3. Take the landscapes of climate finance for German buildings (Novikova et al. 2019) and Czech buildings (Valentová et al. 2019) to determine distribution of investment into new buildings, retrofit of existing buildings, and energy efficiency of appliances/equipment/lights. Apply these proportions to urban investments from Step 2. **Solar Water Heaters** 1. Take Europe's investment in solar water heaters from country-level investment (see China step 1 above) and determine urban share, assuming urban is 75% of the investment. We assumed the same urban share as energy efficiency due to limited data. 2. Break it down into finance providers and instruments using the same energy efficiency split as above. **Heat pumps** 1. Take spending on heat pumps in France, Germany, Italy, Finland, and Spain (BNEF 2022a). 2. Determine urban share, assuming 75% of investment is urban. We assumed the same urban share as energy efficiency due to limited data. 3. Break it down into financial providers and instruments using the same energy efficiency split as above.
USA	**Energy efficiency** 1. Take the USA's incremental buildings' energy efficiency investment from the IEA's World Energy Investment (IEA 2023b). 2. Determine urban share, assuming urban is 80% of investment. Urban buildings contribute slightly more than 80% to the total US buildings stock, and the disposable income difference between urban and rural households in the US is only 5%, meaning that the investment between rural and urban areas is more or less equally distributed (United States Census Bureau 2016). 3. Calculate incremental investment volumes into new and retrofitted LEED green certified buildings based on (Katz Zusman 2011; Freehling and Stickles 2016; GRESB 2019; USGBC 2024). 4. Apply share of debt based on a market assessment which suggests a 65% lending rate for advanced new buildings (Freehling and Stickles 2016). 5. Apply share of public/private finance providers calculated from (Deason et al. 2016) which suggests that lending covered 80% of the investment volume for building retrofits, with more than 75% of lending from private sources. We assumed that the volume that is not addressed by lending is provided by balance sheet financing (equity portion). 6. Calculate investment volumes into appliances/equipment/lights by deducting incremental investment volumes into new and retrofitted green certified buildings from the incremental building energy efficiency investments. 7. Break down appliances/equipment/lights into instruments assuming the market-rate debt/balance sheet equity portion to retrofit existing buildings based on (Deason et al. 2016). We assume all lending is from private sources because the lending sources from public sources were allocated to the retrofit of existing buildings, and no funding from public sources was identified for equipment and appliances.

Region	Methodology & Rationale
	Solar Water Heaters 1. Take the USA's investment in solar water heaters from country-level investment (see China step 1 above) and break it down into urban and rural, assuming urban is 80% of the investment; due to limited data, we have used the same urban percentage as energy efficiency. 2. Break it down into financial providers and instruments based on the same energy efficiency split as above due to limited data availability. **Heat pumps** 1. Take the USA's spending on heat pumps from the (BNEF 2022a). 2. Break it down into urban and rural, assuming 80% of investment is urban; due to limited data available for heat pumps, we have used the same percentage as energy efficiency. 3. Break it down into instruments assuming the market-rate debt/balance sheet equity portion as to retrofit existing buildings; assume all lending is from private sources.
Rest of the world	**Energy efficiency** 1. Take incremental buildings' energy efficiency investment for the "Other" region from the IEA data (IEA 2023b). 2. The "Other" region is broken down into regions and countries based on the proportions analysis of another energy efficiency report (IEA 2020b). More recent investment information was not available, so we relied on the same breakdown data as the 2021 State of Cities Climate Finance Report (CCFLA 2021). 3. Break the investment down into urban and rural investment, assuming urban is 80% based on (UN-DESA 2018) and the fact that most energy efficiency investments (except for energy access) in developing countries occur in cities (similar to China). 4. Calculate incremental investment volumes into new green certified buildings (LEED) based on (GRESB 2019; USGBC 2024) for floor area, (Turner and Downsend 2024) for construction cost, and (ELLA 2013; GBCSA et al. 2016) for an incremental share of being "green" (Average 7% for Developed Economies, Average 12% for Emerging Economies). Assume all green construction takes place in cities. Assume all investment into green construction in Africa, Latin America, and Asia as project-level equity of private investors (no instruments recorded). 5. Based on the CDP-ICLEI Unified Reporting System database, assume the share of retrofits in the total investment volume as 5% for Asia, 1% for Africa, and 1% for Latin America. Assume these investments are grants in Africa and Latin America (pilots recorded) and unknown in Asia. 6. Calculate investment volumes into appliances/equipment/lights, deducting incremental investment volumes into new and retrofitted buildings from the incremental buildings' energy efficiency investment. Assume the instrument for these flows is unknown. **Solar Water Heaters** 1. Take the rest of the world's investment in solar water heaters from country-level investment (see China step 1 above) and determine urban share. We assume urban investment is 80%, following the same percentage as energy efficiency. 2. Break it down into finance providers based on the same energy efficiency split within the energy efficiency sector. We cannot determine instruments due to limited available granular data. **Heat pumps** 1. Take spending on heat pumps for the "Other" region from (BNEF 2022a). 2. Determine urban share, assuming 80% of investment is urban, following the same percentage as energy efficiency. 3. We cannot determine instruments due to limited available granular data.

4.6 CAPITAL EXPENDITURE ESTIMATIONS FOR ENERGY SYSTEMS

The majority of the energy systems investments in SCCFR24 are tracked from project-level data; however, we conducted capital expenditure estimations for small solar panels and included these under energy systems.[23] In the 2021 SCCFR, small solar panels were classified under the buildings & infrastructure sector. However, due to recent changes in taxonomy classification, these have now been reclassified into the energy systems sector. While this reclassification aligns with the evolving landscape of energy technology and investment, the methodology for estimating the capital expenditures for small solar panels still follows SCCFR21. As a result, the capital expenditure estimations numbers on small solar panels are comparable, ensuring continuity and accuracy across reports.

We followed two steps:

1. We calculated investments for small solar panel projects using the BNEF market size generation capacity and finance database (BNEF 2023b), focusing on residential and commercial projects with a capacity of less than 1MW, following the same methodology as in the 2023 GLCF (CPI 2023a).
2. We determined urban shares for renewable energy capital expenditure estimates follow the 2021 SCCFR (CCFLA 2021). We obtained regional proxies from the Buildings Energy Efficiency capital expenditure methodology and adapted them based on further literature research (IRENA 2015). See Table 7 for the regional urban share assumptions applied for small solar panels.

Table 7: Regional urban shares applied for solar PV (energy systems) capital expenditure estimations

Region	Urban Share
Western Europe	75%
Central Asia & Eastern Europe	80%
East Asia & Pacific	80%
Other Oceania	80%
US & Canada	80%
Transregional	80%
Sub-Saharan Africa	80%
Latin America & Caribbean	25%
Middle East and North Africa	80%
South Asia	25%

23 Small solar panels have been classified under sub-sector "Power Heat & Generation" and Solution "Renewable Energy: Solar"

5. NEEDS ASSESSMENT METHODOLOGY

Our primary urban climate finance estimates come from "top-down" climate finance needs. Top-down needs can be defined as the estimated climate finance needed 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 (CPI 2024). 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. This report builds on the CPI database of top-down climate finance needs to produce a city-specific estimate for climate finance needs.[24]

The top-down urban climate finance needs assessment is based on estimating urban shares from the global needs analysis completed within the 2023 GLCF report. The 2023 GLCF needs estimations were broken down by region to facilitate more accurate urban estimations and allow conclusions to be drawn regionally. The methodology had three steps: 1) Compiling a global analysis of climate finance needs (conducted primarily by CPI); 2) Applying a regional breakdown of global climate finance needs; and 3) Applying urban inclusion assumptions to determine the city's needs as a share of global top-down needs.

STEP 1. COMPILING A GLOBAL ANALYSIS OF CLIMATE FINANCE NEEDS

The urban climate finance needs analysis is based on a comprehensive global compilation of estimates on climate investment needs conducted for the 2023 GLCF. The 2023 landscape analysis is based on a collection of several existing scenarios and models that aim to estimate the investment requirements to limit the temperature rise to 1.5°C by the end of the present century in various sectors. The reports are listed in Table 8. Apart from adaptation, we considered sectors in terms of mitigation potential only.

STEP 2. APPLYING A REGIONAL BREAKDOWN OF GLOBAL CLIMATE FINANCE NEEDS

We broke down the global needs analysis for each sector into regions to apply more accurate urban inclusion assumptions. The global needs were divided into regions using existing regional needs analysis from data sources included within CPI's global need analysis. Table 8 summarizes the sources used in Step 1 and Step 2.

24 More details about CPI's top-down needs methodology and data can be found at https://www.climatepolicyinitiative.org/publication/top-down-climate-finance-needs/

Table 8: Sources reviewed for the urban needs scenario and used for regional breakdowns[25]

Sector	Sources used in the 2023 need estimations	Sources used for regional breakdowns
Transport	• (BNEF 2022b) • (IRENA 2023) • (McKinsey 2022) • (IEA 2023b) • (IEA 2019)	• (McKinsey 2022) average annual investment from 2022-2050 for mobility • (IRENA 2020) average annual investment from 2016-2050 • Country-level population data was used to standardize regional classifications (World Bank 2023b)
Buildings & Infrastructure	• (Stern 2021) • (IRENA 2023) • (IEA 2023c) • (McKinsey 2022)	• (McKinsey 2022) average annual investment from 2022-2050 • (IRENA 2020) average annual investment from 2016-2050 using the transforming energy scenario • Country-level population data was used to standardize regional classifications (World Bank 2023b).
Energy Systems	• (BNEF 2022c) • (BNEF 2022b) • (IEA 2021b) • (IRENA 2023) • (Stern 2021) • (IEA 2023c) • (IPCC 2022) • (McKinsey 2022)	• (McKinsey 2022) average annual investment from 2022-2050. • (IRENA 2020) average annual investment from 2016-2050, transforming energy scenario • (IPCC 2022) Chapter 15, average annual investments from 2022-2032 • Energy consumption data was used to standardize regional classifications (Energy Institute 2024).
AFOLU	• (FOLU 2019) • (McKinsey 2022) • (UNEP 2022) • (Stern 2021) • (Deutz et al., 2020) • (Thornton P. et al., 2023)	To produce a regional breakdown for AFOLU, we used the Work Bank dataset on country level value added for agriculture, forestry, and fishing and population regional breakdown for Food & Diet (World Bank 2024b) 1. Data is available by WB region and by country as current USD through 2022. WB regions do not necessarily match the breakdown of other sectors regional breakdown or the GLCF breakdown, but since country-level data is available, regions can be slightly manipulated for comparison to other sectors' regional breakdown. 2.Breakdown is based on the output from the average of the last available five years. We applied this breakdown to the following subsectors: agriculture, forestry, fisheries, food and diet, policy and capacity building, and unspecified (multiple objectives). Only the sub-sector "food and diet" is included in urban estimates. For the subsector "food and diet," we applied a breakdown by population using the same regions and five year average as above.
Industry	• (McKinsey 2022) • (BNEF 2022b) • (IEA 2023c) • (IRENA 2023) • (IEA 2021b)	• (McKinsey 2022) average annual investment from 2022-2050 • (IRENA 2020) average annual investment from 2016-2050 • Country-level population data was used to standardize re-gional classifications (World Bank 2023b).

25 See (CPI 2024) for a full source list of sources reviewed for inclusion and used in previous years

Sector	Sources used in the 2023 need estimations	Sources used for regional breakdowns
Adaptation	• (Chapagain et al. 2020) • (Songwe et al. 2022) • (Bhattacharya et al. 2022) • (Stern 2021) • (UNEP 2023)	To produce a regional breakdown for Adaptation, we applied the regional breakdown from UNEP AGR (2023) from 2021-2040. Our global needs numbers for adaptation only covered LDCs and EMDEs (non-Annex I countries).

STEP 3. APPLYING URBAN INCLUSION ASSUMPTIONS TO DETERMINE THE CITY'S NEEDS AS A SHARE OF GLOBAL TOP-DOWN NEEDS.

We applied urban assumptions by sector, sub-sector, and region where appropriate to estimate the share of climate finance needs that are relevant for cities. Table 9 describes the approach for each sector.

Table 9: Share of urban climate finance needs relevant to cities

Needs Sector	Urban Inclusion Approach
Transport	90% of transport needs are included as urban, based on the approach used for urban transport capital expenditure estimations.
Buildings & Infrastructure	Applied 90% urban to East Asia, 70% to Western Europe, and 80% to the rest of the world. Same approach as urban buildings capital expenditure estimations, based on regional building stock and other underlying research.
Energy Systems	Used urban population share estimates by region, applied only to sub-technologies that met city exclusivity/urban share criteria: • Certain renewables: solar PV, biofuel/biomass, onshore wind, and geothermal; • Energy storage; • Fossil fuel carbon capture and storage; and, • District heating (90% needs included as primarily urban installations). Remaining renewable technologies, power grid investments, and others were excluded due to lack of data, mostly rural installation, and/or inability to determine city exclusivity.
AFOLU	Used urban population share applied to the "Food and Diet" sub-sector only. The remaining sub-sectors (agriculture, forestry, and other land use) were excluded due to urban exclusion criteria.
Industry	30% of investment is included as urban for developed economies and 50% for emerging economies, based on underlying research on urban industrialization.
Adaptation	Varied by sub-sector: River floods were included at 100% (as the underlying model is entirely urban); coastal protection, infrastructure, early warning & social protection, and health sub-sectors were included based on urban population share. Excluded fisheries and marine, agriculture, and terrestrial biodiversity (together 10% of total adaptation needs estimates) due to urban exclusion criteria.

The final mitigation urban inclusion percentages are included in Table 10 (based on a combination of regional and urban shares).

Table 10: Mitigation urban inclusion estimates applied by sector and region

Region	Urban population projection reference (World Bank 2024b)		Transport	Buildings & Infrastructure	AFOLU	Industry	Energy Systems[26]		
							Power & Heat Transmission & Distribution[27]	Power & Heat Generation[28]	
	2023-2030	2030-2050						2023-2030	2030-2050
Other Oceania	67%	69%	90%	80%	67%	30%	90%	67%	69%
Western Europe	78%	82%	90%	70%	78%	30%	90%	78%	82%
Latin America and the Caribbean	83%	86%	90%	80%	83%	50%	90%	83%	86%
Middle East[29]	74%	79%	90%	80%	74%	50%	90%	74%	79%
North Africa	58%	63%	90%	80%	58%	50%	90%	58%	63%
East Asia & Pacific[30]	69%	76%	90%	90%	69%	50%	90%	69%	76%

26 Fuel production and fuel transmission and distribution were excluded as they did not meet our urban inclusion criteria of T&D exclusively for city distribution.
27 Includes only district heating. Remaining new power grid for renewable energy technologies were excluded as they did not meet our urban inclusion criteria of T&D exclusively for city distribution. Remaining technologies were excluded due to lack of data.
28 Includes energy storage, carbon capture and storage, and the following renewable energy generation sub-technologies: biofuel/biomass; solar-PV; onshore wind; geothermal. Remaining renewable energy generation sub-technologies were excluded as they did not meet our urban inclusion rule of exclusively serving the city (these were: concentrated solar power, offshore wind, hydropower, marine energy, and other or unspecified energy sources).
29 Combined with North Africa to align with GLCF and SCCFR regions.
30 Combined with Southeast Asia to align with GLCF and SCCFR regions.

Region	Urban population projection reference (World Bank 2024b)		Transport	Buildings & Infrastructure	AFOLU	Industry	Energy Systems[26]		
							Power & Heat Transmission & Distribution[27]	Power & Heat Generation[28]	
	2023-2030	2030-2050						2023-2030	2030-2050
Southeast Asia	58%	65%	90%	80%	58%	50%	90%	58%	65%
South Asia	38%	47%	90%	80%	38%	50%	90%	38%	47%
Central Asia & Eastern Europe	69%	73%	90%	80%	69%	50%	90%	69%	73%
Sub-Saharan Africa	45%	53%	90%	80%	45%	50%	90%	45%	53%
US & Canada	84%	87%	90%	80%	84%	30%	90%	84%	87%

ADAPTATION NEEDS URBAN INCLUSION

A subsection of relevant adaptation sub-sectors was selected from (UNEP 2023) (Coastal, health, early warning, and social protection), with the proportion of urban population (2023-2050) applied (World Bank 2023b). The urban inclusion percentages and relative percentage of adaptation needs are specified in Table 11.

Table 11: Adaptation urban inclusion estimates

UNEP AGR Adaptation Sub-Sectors	Percentage of global Adaptation Needs Estimates (%)	Urban inclusion approach
River floods	26.0%	100%, as the underlying model exclusively considers urban areas.
Coastal	26.0%	Included based on urban population share by region.
Infrastructure	25.1%	
Early warning and social protection	7.4%	
Health	5.1%	
Agriculture	7.4%	Exclude as mostly rural investments.
Fisheries and Marine	2.3%	
Terrestrial biodiversity	0.7%	

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