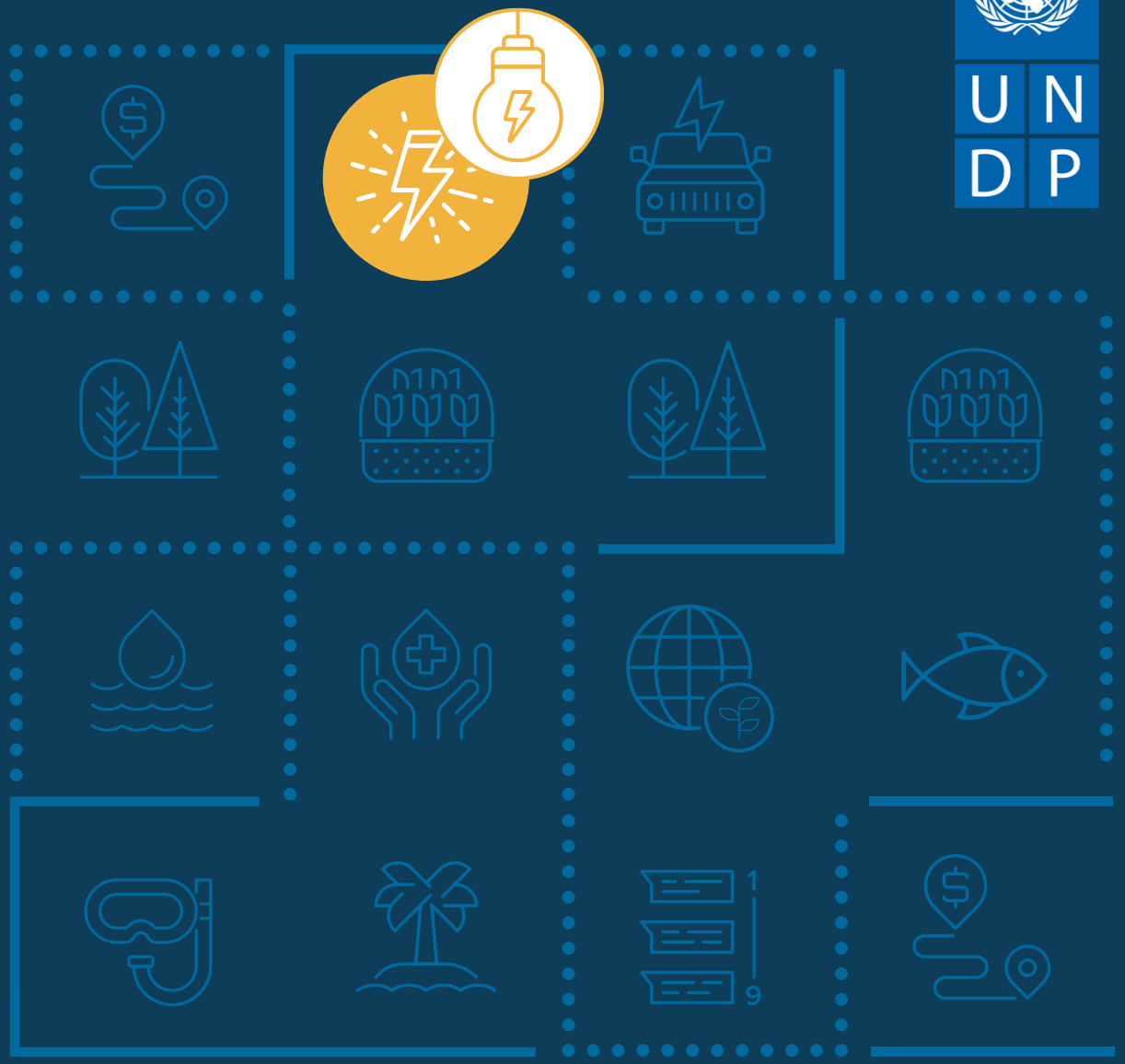
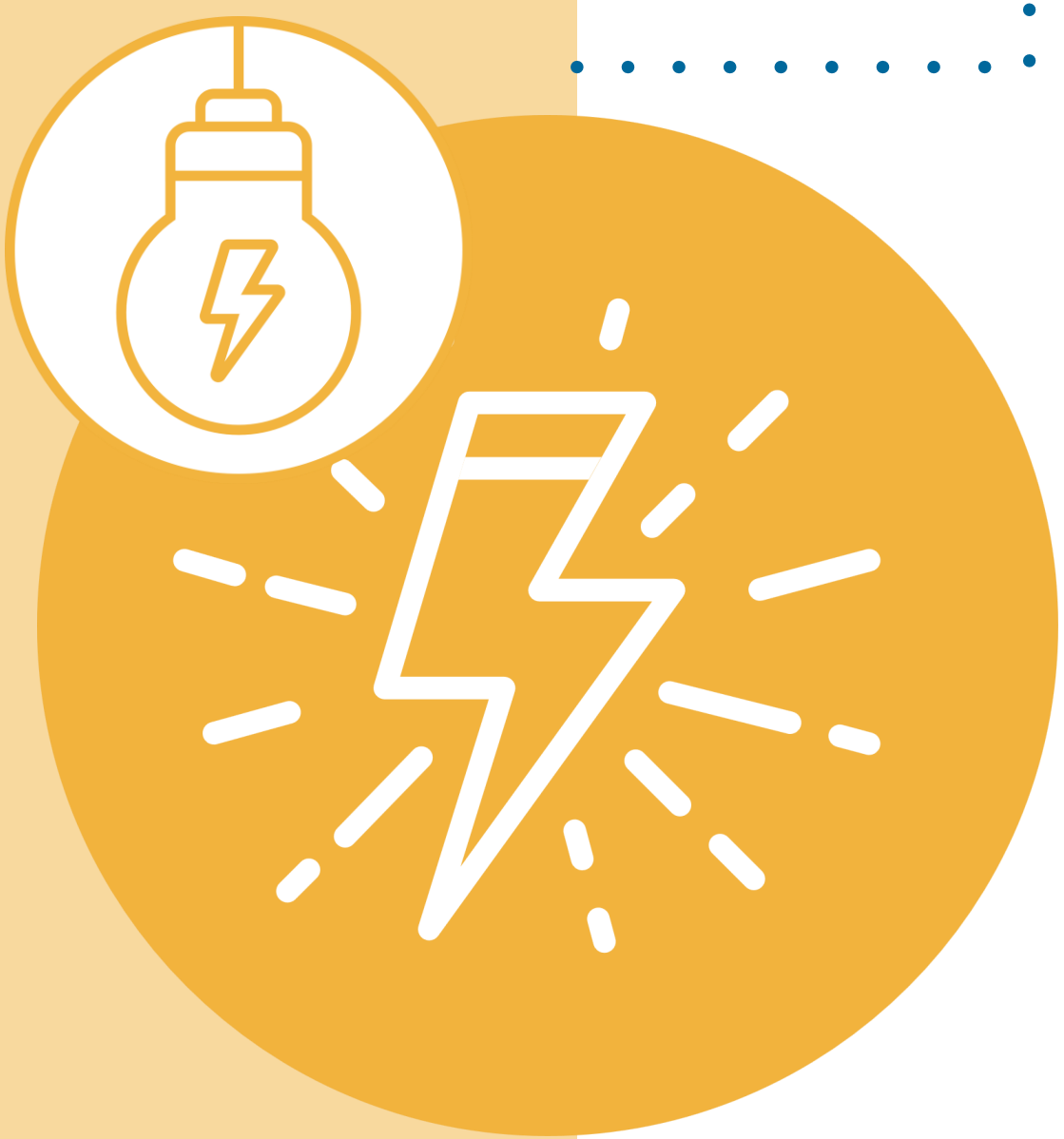
UNITED NATIONS DEVELOPMENT PROGRAMME

GUIDEBOOK

on the methodology for financial assessments to address climate change

ASESSING INVESTMENT & FINANCIAL FLOWS FOR MITIGATION IN THE ELECTRICITY SECTOR





Relevance of the electricity sector

- Global emissions intensity from electricity generation is on a sharply contracting trend, with a record 3% reduction in 2024 compared to 1% in 2023 (IEA, 2025).
- The energy sector includes emissions from electricity and heat, which represent 29.7% of energy sector emissions, the largest share of energy emissions (WRI, 2024).

Step 1. Establish key parameters of assessment.

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Step 3. Define baseline scenario.

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Step 9. Synthesize results and complete the report.

Step 1.

Establish key parameters of the assessment.

- Define scope and boundaries for the assessment
- Define the institutional framework
- Specify the time horizon for the assessment, should match national target being assessed (e.g. 2025-2050)
- Build on existing model, projections or budget tracking where applicable

Define boundaries for the assessment

Example list of subsectors for screening and prioritization

Subsectors	Data availability	Investment (prior 10 years)	Priority in target scenario		
			High	Medium	Low
Fossil-fired generation					
Total electricity					
Hydro energy					
Wind energy					
Biofuel energy					
Tidal energy					
Nuclear energy					
Transmission & distribution					
Other renewables					

Define boundaries for the assessment

Potential scope of assessment:

- Electricity generation
  - Gas fired power plant
  - Low-carbon alternatives
  - Sequestration technologies
- Electricity transmission
- Electricity distribution
- Demand-side efficiency
  - Industry, transport, residential/commercial?

Select analytical approach

To project demand and supply in the sector:

- Development of simple speadsheets
- Use of existing energy models
- Sector projections/trends

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Step 2.

Compile historical IF, FF and O&M cost data, subsidy cost data (if included explicitly), and other input data for scenarios.

- Gather disaggregated IF and FF data on investment types, investment entities and funding sources for 3-10 years in the recent past
- Gather socio-economic information (demographic development, economic development etc.) for 3-10 years in the recent past

Data sources

Sources of data:

- Sectoral plans
- Development plans
- Energy sector/econometric models
- National budget tagging/tracking or transparency mechanisms
- Private sector reports
- GHG Inventories, National Communications etc.
- System of National Accounts (SNA), Systems of integrated environmental and economic accounts (SEEA)

Data sources

Name	Developer	Platform	Methodology	Cost (US$)/ Licensing	Website/Contact	Description
Energy Costing Tool	UNDP	Excel	Accounting	Free	https://www.undp.org/asia-pacific/publications/energy-costing-tool-user-guide	Estimates the amounts & types of energy investments required to meet the Millennium Development Goals
CREST: Cost of Renewable Energy Spreadsheet Tool	NREL	Excel	economic cash-flow models	Free	https://www.nrel.gov/analysis/crest	Contains economic, cash-flow models designed to assess project economics, design cost-based incentives, and evaluate the impact of state and federal support structures on renewable energy.
HOMER: Hybrid Optimization of Multiple Energy Resources	National Renewable Energy	Windows	Optimization	Free	www.nrel.gov/homer	Design of off- & on-grid electrification options
LEAP: Long-range Energy Alternatives Planning system	Stockholm Environment Institute	Windows	Physical Accounting, Simulation	Free to qualified users from developing countries.	https://leap.sei.org/	Integrated Energy/Environment Analysis
…	…	…	…	…	…	…

Historical data

Historical data (e.g. 2015-2025)	Projected data (2025-2050)
• Electricity production by fuel and technology • Electricity consumption by sector and fuel • Inventory of large generation and transmission infrastructure, including commissioning and expected retirement/upgrade timescales • Capital infrastructure investment data 2015-2025 • O&M data for key infrastructure • Electricity price and subsidy data • GHG emissions data for electricity sector • Power generation efficiencies 2015-2025 • Transmission and distribution losses 2015-2025 • National energy resource assessments	• Socio-economic growth forecasts (population/GDP) • National energy forecast models • Forecasts for electricity production • Forecast electricity demand and export • National resource assessments by fuel • Forecast sector investment data • Forecast upgrades for end of life equipment • Forecasts for price support and subsidies • Emissions projections for sector 2025-2050 • Cost forecasts for new and emerging technologies

Data collection

- Compile disaggregated annual IF and FF data:
  - By investment type e.g.:
    - Switching to renewable energy sources
    - Improving efficiency of electricity production (e.g. gas turbine efficiency)
  - By investment entity:
    - Government
    - Enterprises
    - Households
  - By funding source:
    - Domestic
    - Foreign

Data collection

Examples of IF and FF data disaggregation in each subsector

Category of investment entity	Source of IF and FF	Investment Type 1 (IF, FF, Total)	Investment Type 2 (IF, FF, Total)	Investment Type 3 (IF, FF, Total)	Total investment
Households	Domestic				
Corporations	Domestic				
	Foreign				
	Total Corporation Funds				
Government	Domestic				
	Foreign				
	Total Government Funds				

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Define a baseline scenario.

- Define the physical basis for the baseline scenario
- **Baseline scenario:** description of what is likely to occur in the absence of ADDITIONAL policies to address climate change; expected socioeconomic trends (e.g., population growth and migration, economic growth), technological change and expected business-as-usual investments in the sector.

Define baseline scenario

- Characterizing each relevant electricity supply and electricity end-use subsector over the assessment period
  - Assuming no new climate change policies are implemented
- Baseline scenario reflects:
  - Current sectoral and national plans
  - Expected socio-economic trends
  - Expected investments in the subsectors

Define physical basis for the baseline scenario

- Information should be disaggregated by:
  - Year (starting 10 years before the assessment's Base Year)
  - Source (by corporations and government)
  - Type (national funds, foreign direct investment, official development assistance

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Step 4.

Identify the annual IF, FF and O&M costs, and subsidy costs (if included explicitly), for baseline scenario.

- Compile annual data, disaggregated by investment entity, funding source, investment flow type, financial flow type
- Calculate the **total IF and FF** in real, unannualized terms over the planning period
- Define **annual IF and FF** of the baseline scenario

Define and project annual IF and FF

Funding entity category	Source of funds	Cumulative IF and FF* 2025-2050 (billion 2025 $)	
		IF	FF
Households	Domestic		
Corporations	Domestic equity		
	Foreign investment		
	Domestic debt		
	Foreign borrowing		
	Government support		
	Foreign aid (ODA)		
Government	Domestic funds (budgetary)		
	Foreign borrowing (loans)		
	Foreign aid (ODA)		
	Total		

* Hydro plant, solar panel, wind turbine, geothermal facility, labour…

Define and project annual IF and FF

	Energy sector Million US$ 2025 (constant 2025 dollar)					
	Wind power plants			....		
Year	**IF**	**FF**	**O&M**	**IF**	**FF**	**O&M**
2025	**32**	-				
2026	**150**	-	2			
…	**…**	…	…			
2042	**0**	-	2			
2043	**0**	-	2			
2044	**0**	-	2			
2045	**0**	-	2			
2046	**0**	-	2			
2047	**0**	-	2			
2048	**0**	-	2			
2049	**0**	-	2			
2050	**0**	-	2			
Total	**182**	-	64			

Define and project annual IF and FF

			Energy sector (2025-2050)					
			Electricity supply			…		
Investment entity	**Source of IF and FF**		**IF**	**FF**	**O&M**	**IF**	**FF**	**O&M**
Households	National	Equity and debt						
Enterprises		Own capital						
	National	Domestic capital			64			
		IED						
		External loans						
	Foreign	External Assistance	182					
	Total enterprises funds							
Government	National	Own funds						
		External loans						
	Foreign	External assistance						
	Total Government funds							
TOTAL								

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Define the target scenario.

- **Target scenario:** incorporates new and scaled-up measures to address climate change
- The target scenario should describe expected socio-economic trends, technological change, relevant measures to reduce GHG emissions and the expected investments in the energy sector (e.g. end-use & supply subsectors) to implement those mitigation measures

Energy sector mitigation measures

	Energy supply measures		Energy end-use measures	
Category of mitigation measure	**Reduce combustion emissions**	**Reduce fugitive emissions**	**Reduce combustion emissions**	**Reduce energy demand**
Improve efficiency of energy use	Efficiency improvements in energy supply processes		Efficiency improvements in energy end-use technologies	Energy conservation measures
Reduce emissions per unit of energy production or use	Switch to lower carbon fuels		Switch to lower carbon fuels	
	Switch to alternative energy sources		Switch to alternative energy sources	
		Reduce fugitive losses (including recovery and use)		

Two approaches to define target scenario

- Approach #1: assume an end point for electricity supply emissions
  - E.g. Set a target in 2030 for emissions from the electricity sector
- Approach #2: assume a set of technologies for electricity supply
  - E.g. Articulate a set of technological options to meet future energy demand

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Step 6.

Identify annual IF, FF and O&M costs (and subsidy costs if included) for the target scenario.

- Compile annual data, disaggregated by investment entity, funding source, investment flow type, and financial flow type
- Calculate the **total IF and FF** in real, unannualized terms over the planning period.
- Define **annual IF and FF** of the target scenario

Project IF and FF of target scenario

Facility/technology	Cumulative infrastructure (2025-2050)	Unit cost
Wind energy plant	(# units)	(2025 $/unit)
Energy efficient light bulbs	(# pieces)	(2025 $/piece)
…	(# …)	(2025 $/…)
Total		

Define and project annual IF and FF

Funding entity category	Source of funds	Cumulative IF and FF 2025-2050 (billion 2025 $)	
		IF	FF
Households	Domestic		
Corporations	Domestic equity		
	Foreign investment		
	Domestic debt		
	Foreign borrowing		
	Government support		
	Foreign aid (ODA)		
Government	Domestic funds (budgetary)		
	Foreign borrowing (loans)		
	Foreign aid (ODA)		
	Total		

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Step 7.

Calculate the changes in IF, FF and O&M costs (and in subsidy costs if included explicitly) needed to implement target scenario.

- Subtract the annual IF and FF of the baseline scenario, by entity and funding source, from the annual IF and FF of the target scenario, by entity and funding source
- Sum incremental amounts over all years, by entity and funding source

Determine changes in IF and FF

IF and FF of target scenario

minus

IF and FF of baseline scenario

= Additional IF and FF

- For each mitigation option the assessment must identify the additional IF and FF by source (national funds, etc.) throughout the assessment period, which is necessary for its implementation.

Subtract baseline IF and FF from the target IF and FF

- For each chosen electricity mitigation option, identify the incremental investment and financial flows by funding source (domestic funds, ODA, FDI etc.) throughout the assessment period to implement the national target being assessed

Calculate incremental IF and FF

Funding entity category	Source of funds	Investment (billion 2025 $)		
		Cumulative (2025-2050)		Incremental
		Baseline scenario	Target scenario	
Households	Equity & debt	Baseline value	Target value	Target minus Baseline value
Corporations	Domestic equity	…	…	…
	Foreign investment			
	Domestic debt			
	Foreign borrowing			
	Government support			
	Foreign aid (ODA)			
Government	Domestic funds (budgetary)			
	Foreign borrowing (loans)			
	Foreign aid (ODA)			
	Total	Sum (Baseline)	Sum (Target)	Sum (Target minus Baseline)

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Identify policy implications.

- Identify the entities responsible for the significant incremental changes in investment and financial flows
- Determine the predominant sources of their funds
- Determine policy instruments and incentives to induce the required changes in investment and financial flows

Assess policy options

Policy objectives	Economic instruments	Regulatory instruments	Policy processes		
			Voluntary agreements	Information & strategic planning	Technological RD&D & deployment
Energy efficiency	• Higher energy taxes • Lower energy subsidies • Power plant GHG taxes • Fiscal incentives • Tradable emissions permits	• Power plant minimum efficient standards • Best available technologies prescriptions	• Voluntary commitments to improve power plant efficiency	• Information and education campaigns	• Cleaner power generation from fossil fuels
Energy source switching	• GHG taxes • Tradable emissions permits • Fiscal incentives	• Power plant fuel portfolio standards	• Voluntary commitments to fuel portfolio changes	• Information and education campaigns	• Increased power generation from renewable, nuclear and hydrogen
Renewable energy	• Capital grants • Feed-in tariffs • Quota obligation and permit trading • GHG taxes • Tradable emissions permits	• Targets • Supportive transmission tariffs and transmission access	• Voluntary agreements to install renewable energy capacity	• Information and education campaigns • Green electricity validation	• Increased power generation from renewable energy sources

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Synthesize results and complete report.

- Reporting takes place throughout the assessment, does not start at the end of the assessment
- Capturing information and data, decisions and assumptions completely and transparently
- Ensuring credibility of the assessment and enabling follow-up on the assessment results
- The Reporting Guidelines contain key tables required. Excel spreadsheets are available to organize and calculate data.

Q&A Clarifications

About UNDP

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UNDP's Climate Promise is the UN system's largest portfolio of support on climate action, working with more than 140 countries and territories and directly benefiting 37 million people. This portfolio implements over US$2.45 billion in grant financing and draws on UNDP's expertise in adaptation, mitigation, carbon markets, climate and forests, climate risk and security, and climate strategies and policy. Visit our website at climatepromise.undp.org and follow us at @UNDPplanet.

About this publication

This methodology is an update to the first financial assessment methodology, which was released in 2009. The objective of this methodology is to support countries to implement their climate targets and to identify, reallocate, mobilize and manage the required financial resources and to create a fiscal framework conducive for climate action.

The update to this methodology was developed under UNDP's Climate Promise by the *Pledge to Impact* Programme. Delivered in collaboration with a wide variety of partners, the initiative has supported over 120 countries to enhance and implement Nationally Determined Contributions (NDCs) under the Paris Agreement. From Pledge to Impact is generously supported by the governments of Germany, Japan, United Kingdom, Sweden, Belgium, Spain, Iceland, the Netherlands, Portugal and other UNDP core contributors. This programme underpins UNDP's contribution to the NDC Partnership.

UN disclaimer

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