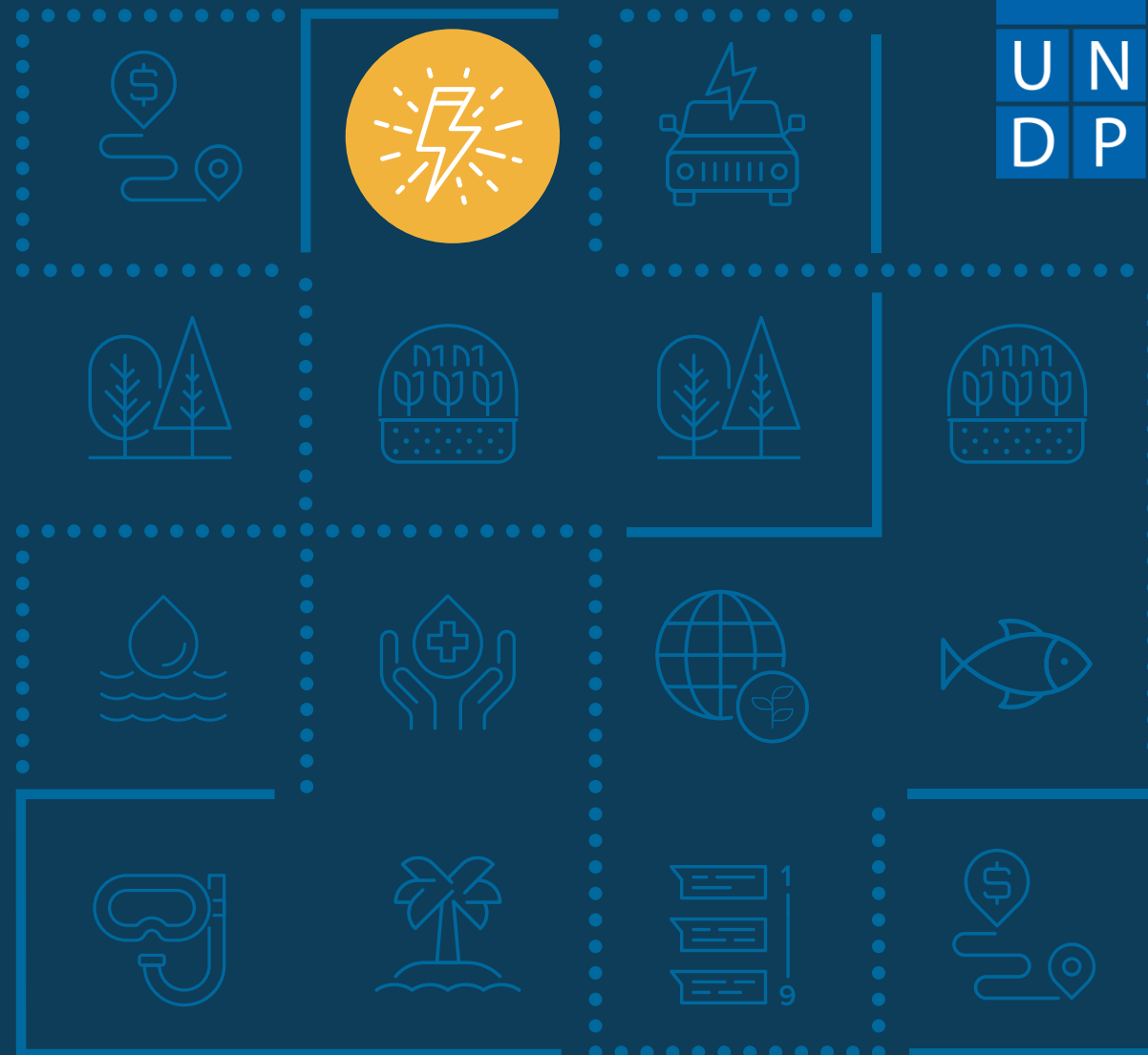


GUIDEBOOK

on the methodology for financial assessments to address climate change

FINANCIAL ASSESSMENT TO ADDRESS CLIMATE CHANGE IN THE ENERGY SECTOR





Relevance of the energy sector

- Primary source of global greenhouse gas (GHG) emissions.
- Emissions from this sector **have grown faster** than those in any other sector since 1970 and will continue to be the largest source of global GHG emissions.
- Energy sector is **key to development**: energy-related GHG emissions are increasing in most highly dynamic (high growth) developing countries (IPCC, 2023).
- **Some mitigation options bring important local co-benefits**: energy security, low-cost energy options, improved local environmental and health conditions, etc.

Step 1. Establish key parameters of assessment.



Step 2. Compile historical IF, FF and O&M cost data (and subsidy cost data if included explicitly) and other input data for scenarios.



Step 3. Define baseline scenario.



Step 4. Identify annual IF, FF and O&M costs (and subsidy costs if included explicitly) for the baseline scenario.



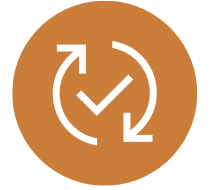
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Step 7. Calculate the changes in IF, FF and O&M costs (and in subsidy costs if included explicitly) needed to implement target scenario.



Step 8. Identify policy implications.



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, matching the time horizon of national target being assessed
- Specify base year (latest year with data available)
- Build on existing model/analysis/tracking system as applicable

Step 1. Establish key parameters of the assessment.



Define boundaries for the assessment

Example list of subsectors for screening and prioritization

Subsectors	Data availability	Investment (prior 10 years)	Priority in target scenario			Rank
			High	Medium	Low	
Fossil-fired generation						
Total electricity						
Oil supply						
Gas supply						
Coal supply						
Petroleum refining						
Electricity, gas distribution & water supply						
Gas distribution						
Nuclear generation						
Transmission & distribution						
Renewables including Large & small hydro						



Select analytical approach

- Development of simple spreadsheets based on Excel sheets provided by this financial assessment methodology
- Building on existing energy models, tracking system, budget tagging as applicable
- Use sector projections/trends to determine projected demand and supply in the sector

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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 (e.g. wind energy facilities, biomass fired power plant, etc.), 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

Step 2. Compile historical IF, FF and O&M cost data (if included explicitly), and other input data for scenarios.



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)

Step 2. Compile historical IF, FF and O&M cost data (if included explicitly), and other input data for scenarios.



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
...

Step 2. Compile historical IF, FF and O&M cost data (if included explicitly), and other input data for scenarios.



Historical data

Historical data (e.g. 2015-2025)

- 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

Projected data (2025-2050)

- 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

Step 2. Compile historical IF, FF and O&M cost data (if included explicitly), and other input data for scenarios.



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

Step 2. Compile historical IF, FF and O&M cost data (if included explicitly), and other input data for scenarios.



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				

Step 1. Establish key parameters of assessment.



Step 2. Compile historical IF, FF and O&M cost data (and subsidy cost data if included explicitly) and other input data for scenarios.



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Step 4. Identify annual IF, FF and O&M costs (and subsidy costs if included explicitly) for the baseline scenario.



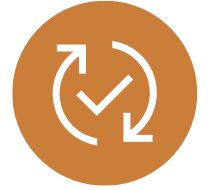
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Step 8. Identify policy implications.



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Step 3.



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)



Step 1. Establish key parameters of assessment.



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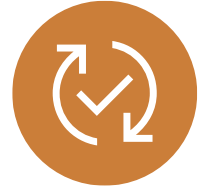
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Step 4.



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

Step 4. Identify the annual IF, FF and O&M costs, and subsidy costs (if included explicitly), for 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		
	Domestic equity		
Corporations	Foreign investment		
	Domestic debt		
	Foreign borrowing		
	Government support		
	Foreign aid (ODA)		
Government	Domestic funds (budgetary)		
	Foreign borrowing (loans)		
	Foreign aid (ODA)		
Total			

* High efficiency industrial motors, passive and active solar water heaters, high efficiency cook stoves, services...

Step 4. Identify the annual IF, FF and O&M costs, and subsidy costs (if included explicitly), for baseline scenario.



Define and project annual IF and FF

Energy sector Million US\$ 2025 (constant 2025 dollar)						
Year	Wind power plants				
	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			

Step 4. Identify the annual IF, FF and O&M costs, and subsidy costs (if included explicitly), for baseline scenario.



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					
		Own capital					
	National	Domestic capital		64			
		IED					
		External loans					
	Foreign	External Assistance	182				
		Total enterprises funds					
	National	Own funds					
		External loans					
Government	Foreign	External assistance					
		Total Government funds					
TOTAL							

Step 1. Establish key parameters of assessment.



Step 2. Compile historical IF, FF and O&M cost data (and subsidy cost data if included explicitly) and other input data for scenarios.



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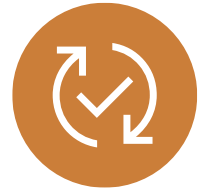
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Step 8. Identify policy implications.



Step 9. Synthesize results and complete the report.



Step 5.



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

Step 5. Define the target scenario.



Energy Sector mitigation measures

Category of mitigation measure	Energy supply measures		Energy end-use measures	
	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

Step 6. Identify the annual IF, FF and O&M costs, (and subsidy costs if included), for the target scenario.



Derive IF and FF of target scenario

Facility/technology	Infrastructure (cumulative for 2025-2050)	Unit cost
Wind energy facility	(# unit)	(2025 \$/unit)
Energy saving light bulbs	(# piece)	(2025 \$/piece)
Insulation of public buildings	(# m ²)	(2025 \$/m ²)
Total		

Step 6. Identify the annual IF, FF and O&M costs, (and subsidy costs if included), for the target scenario.



Define and project annual IF and FF

		Cumulative IF and FF 2025-2050 (billion 2025 \$)	
		IF	FF
Funding entity category	Source of funds		
Households	Domestic		
	Domestic equity		
	Foreign investment		
Corporations	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

Step 7. Calculate the changes in IF, FF and O&M costs (and in subsidy costs if included explicitly) needed to implement target scenario.



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 to implement the national target being assessed.

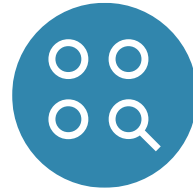
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Calculate incremental IF and FF

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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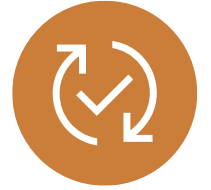
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Step 8.



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

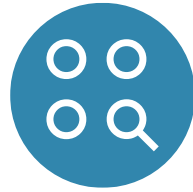
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Examples of policy options

Mitigation measure	Economic instrument	Regulations	Information provision	Other instruments
Energy efficiency improvement	Energy tax Tradable permits Fiscal incentives for efficient appliances	Performance standards for electric appliances	Information campaigns Labelling of energy efficient equipment	Voluntary Agreements R&D programme (to develop more efficient technologies)
Energy source switching (e.g. substitute biomass for fossil fuels)	GHG tax Tradable permits	Power plant fuel portfolio standards	Information provision/ campaigns	R&D programme (e.g. to develop Hydrogen)
Increased renewable energy capacity	Capital grants Feed-in tariffs Tradable permits	Renewable targets	Green electricity validation	Voluntary Agreements

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Step 9.



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

UNDP is the leading United Nations organization fighting to end the injustice of poverty, inequality, and climate change. Working with our broad network of experts and partners in 170 countries, we help nations to build integrated, lasting solutions for people and planet. Learn more at undp.org or follow at [@UNDP](https://twitter.com/UNDP).

About UNDP's Climate Promise

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](https://twitter.com/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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