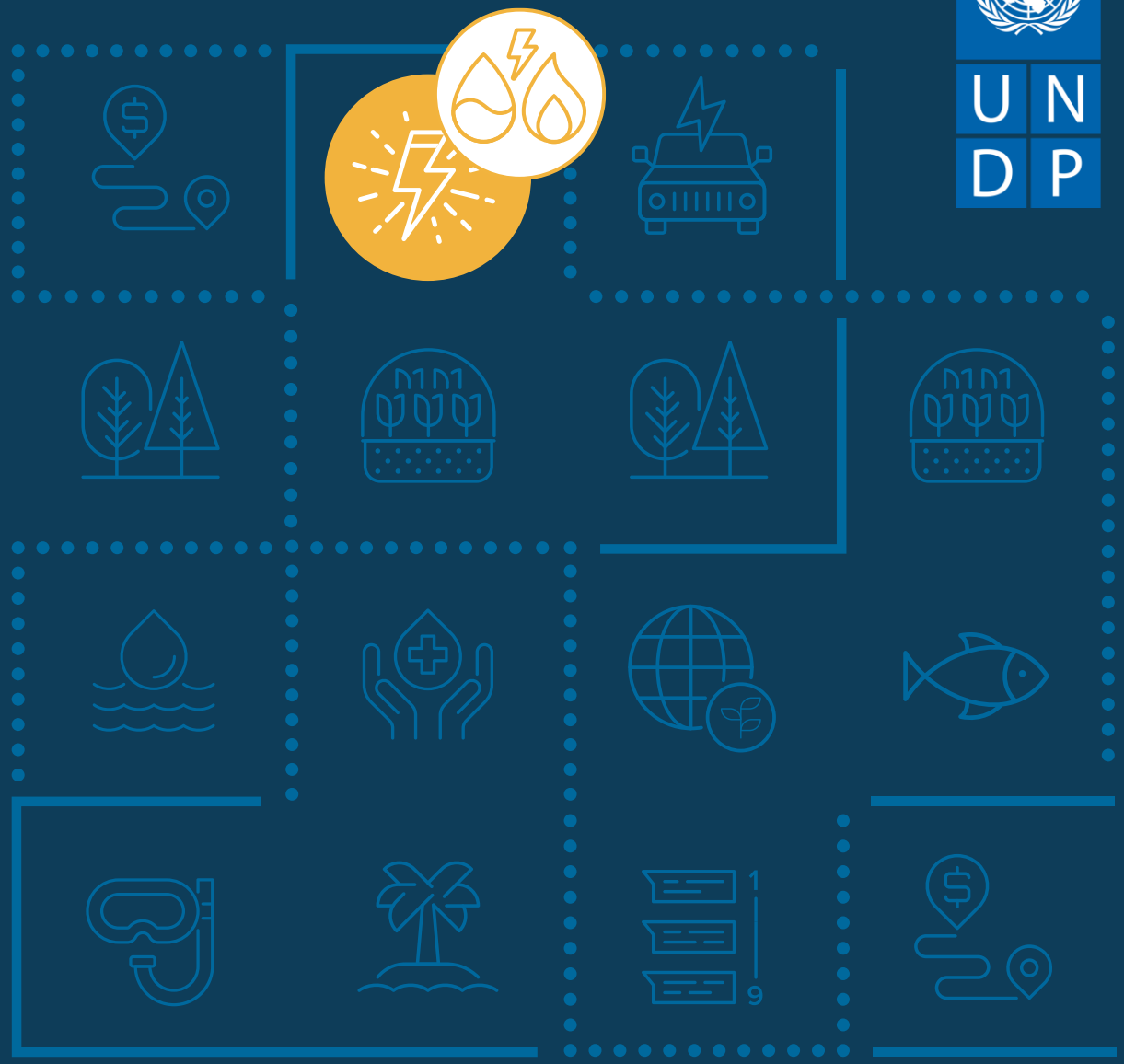
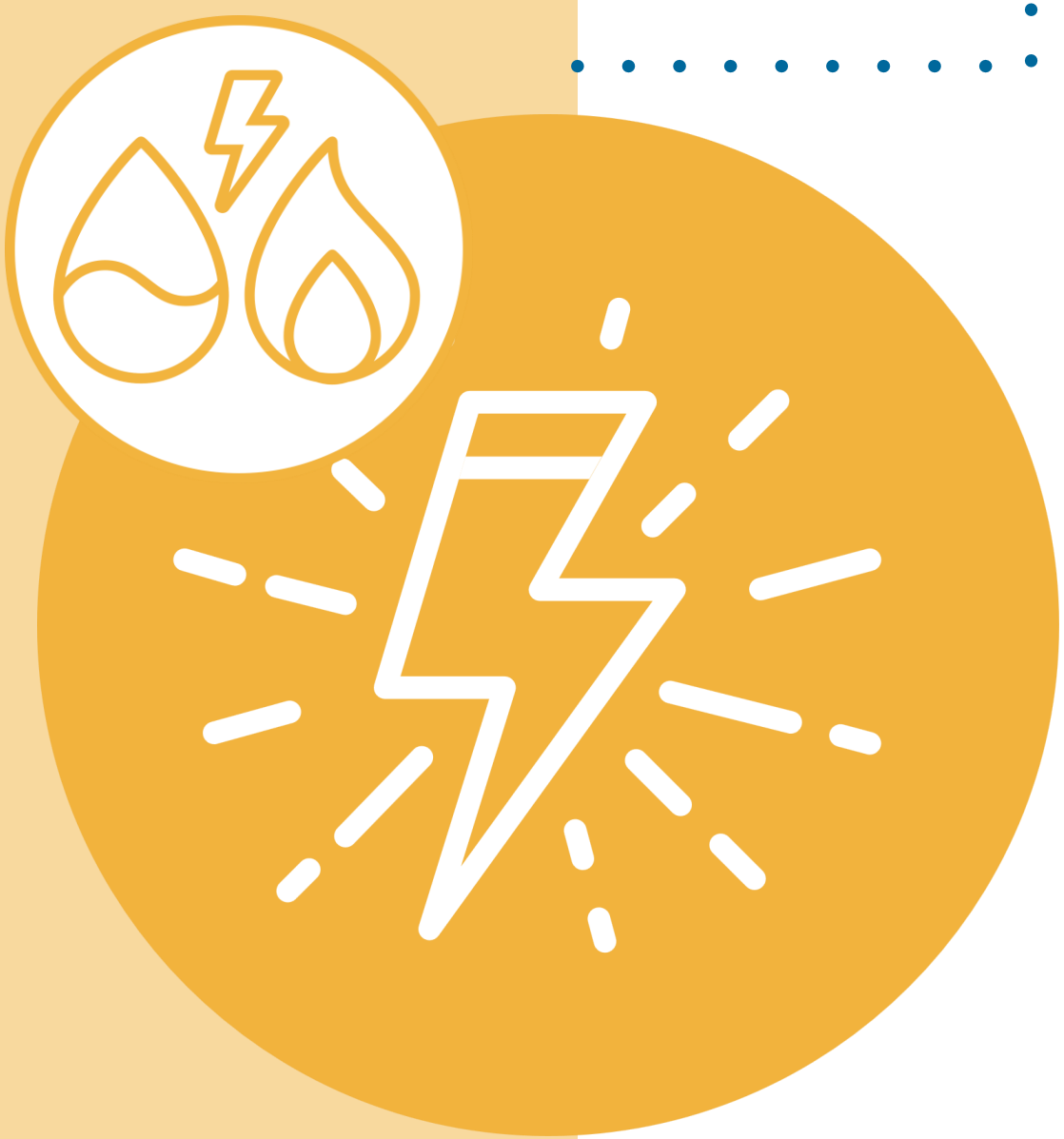
UNITED NATIONS DEVELOPMENT PROGRAMME

GUIDEBOOK

on the methodology for financial assessments to address climate change

FINANCIAL ASSESSMENTS TO ADDRESS CLIMATE CHANGE IN THE OIL & GAS SECTOR





Relevance of the Oil & Gas sector

- The oil and gas sector is characterized by its high capital intensity, long-term planning, and significant technical expertise.
- It is divided into three main segments: upstream (exploration and production), midstream (transportation and storage) and downstream (refining and distribution).
- Around 50% of the methane emitted from oil and gas infrastructure can be mitigated at net-negative costs. That is, the market price of the recovered methane is higher than the mitigation costs (IEA, 2021).

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.

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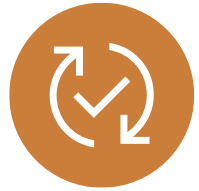

Step 8. Identify policy implications.

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

Define boundaries for the assessment

Potential scope of assessment:

- Exploration and production
  - Drilling
  - Flaring
- Transportation
- Processing and refining
- Demand side efficiency
  - Industry, transport, residential/commercial?

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	Rank
Gas extraction						
Gas transport						
Gas distribution						
Oil extraction/Flaring						
Oil/Petroleum refining						
(Oil or Gas) Storage						

Identify mitigation options

Determine projected demand and supply:

- Identify mitigation options based on national target assessed e.g.:
  - Efficiency measures at refineries
  - Substitution of gas-pumping units
  - Collection instead of flaring, etc.
- Select analytical approach:
  - Development of simple speadsheets
  - Use of existing energy models
  - Sector projections/trends

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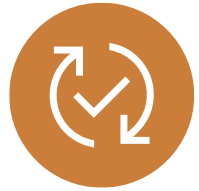

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Step 2.

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

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 & 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
…	…	…	…	…	…	…

Data collection, rely on national accounts data

- Compile disaggregated annual IF and FF data:
  - By investment type e.g.:
    - Reconstruction of oil refineries, disaggregation possible:
      - At the national level
      - By region
      - By refinery?
        (e.g., Reconstruction
        of the Turdkmenbashinsky complex)
  - By investment entity:
    - Government
    - Enterprises
    - Households
  - By funding source:
    - Domestic
    - Foreign

Data collection

Historical data (e.g. 2015-2025)

- Oil & gas production volumes by site
- Oil & gas consumption by sector & fuel
- Inventory of large oil & gas infrastructure, including commissioning and expected retirement/upgrade timescales
- Capital infrastructure investment data 2015-2025
- O&M data for key infrastructure
- Oil & gas price and subsidy data
- GHG emissions data for oil & gas sector
- Power generation efficiencies 2015-2025
- Transmission and distribution losses 2015-2025
- National resource assessments for oil & gas
- Overview of oil & gas concessions and field ownership structure

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

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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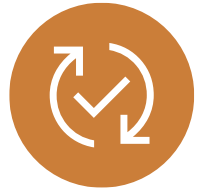

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Define a baseline scenario.

- 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 & government)
  - Type (national funds, foreign direct investment, official development assistance

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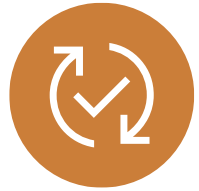

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Step 4.

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

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		

* Improved well and pipeline network, heat recovery systems, data-driven production optimization software, research…

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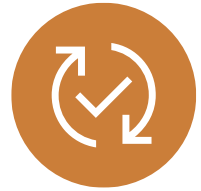

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Step 5.

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 and supply subsectors) to implement those mitigation measures

Oil and Gas 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	Switch from flaring to capture/utilization	Improve efficiency of own energy consumption (lower carbon fuels or alternative energy sources)	Energy conservation measures
Reduce emissions in gas transport process		Leaks detection & measuring, leak repair plan		

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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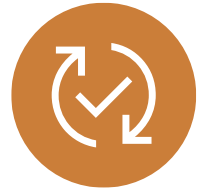

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Step 6.

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

Derive IF and FF of target scenario

Adding costs to mitigation scenario

Facility/technology	Infrastructure (cumulative for 2025-2050)	Unit cost
Improved efficiency of oil extraction by switching from flaring to capture/utilization	(# units)	(2025 $/unit)
Reducing emissions in gas transport process by detecting and repairing leaks	(# 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		
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	Government support		
	Foreign aid (ODA)		
Government	Domestic funds (budgetary)		
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	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 to implement the national target being assessed.

Calculate incremental IF and FF

Funding entity category	Source of funds	Investment (billion 2025 $)		
		Cumulative (2025-2050)		
		Baseline scenario	Target scenario	Incremental
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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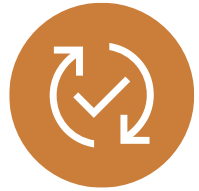

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Identify policy implications.

- 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

Access policy options

Policy objectives	Economic instruments	Regulatory instruments	Policy processes		
			Voluntary agreements	Dissemination of information and strategic planning	Technological research, development, demonstration and 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 agreements to fuel portfolio changes	• Information and education campaigns	• Increased power generation from renewable, nuclear and hydrogen as an energy carrier
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
Carbon capture and storage	• GHG taxes • Tradable emissions permits	• Emissions restrictions for major point source emitters	• Voluntary agreements to develop and deploy CCS	• Information campaigns	• Chemical and biological sequestration • Sequestration in underground geological formations

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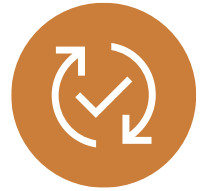

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Synthesize results and complete report.

- 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

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.

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.

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

CLIMATE PROMISE

From the People of Japan

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