

Atenuación de los Riesgos para las Inversiones en Energía Renovables (DREI)

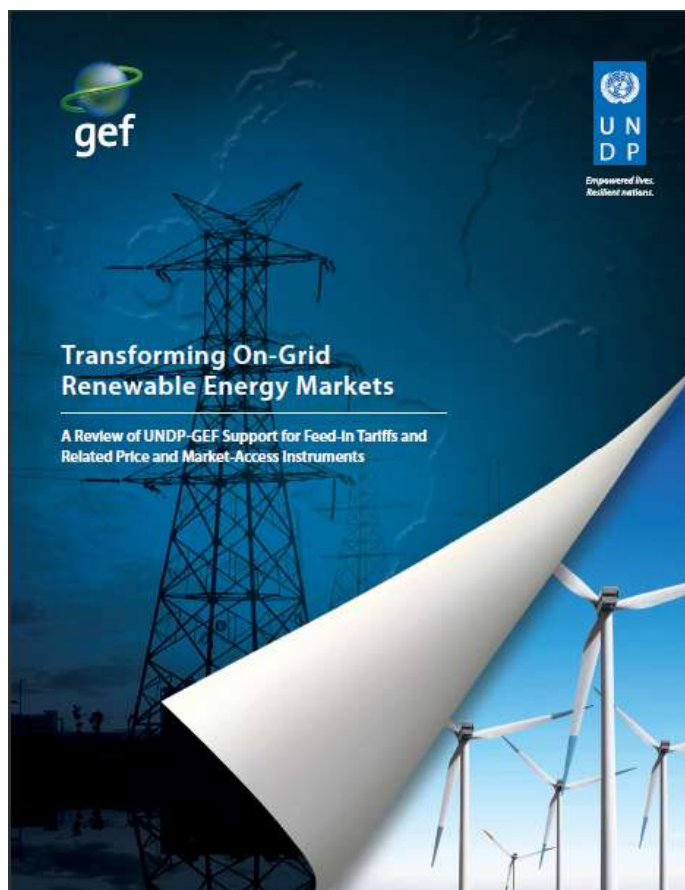
Un marco para apoyar a los tomadores de decisiones en seleccionar instrumentos de acción pública para promover inversiones en energía renovable en los países en desarrollo

Cartagena de Indias, Colombia, 17 de Julio de 2013
Mateo Salomon, Analista Técnico Regional

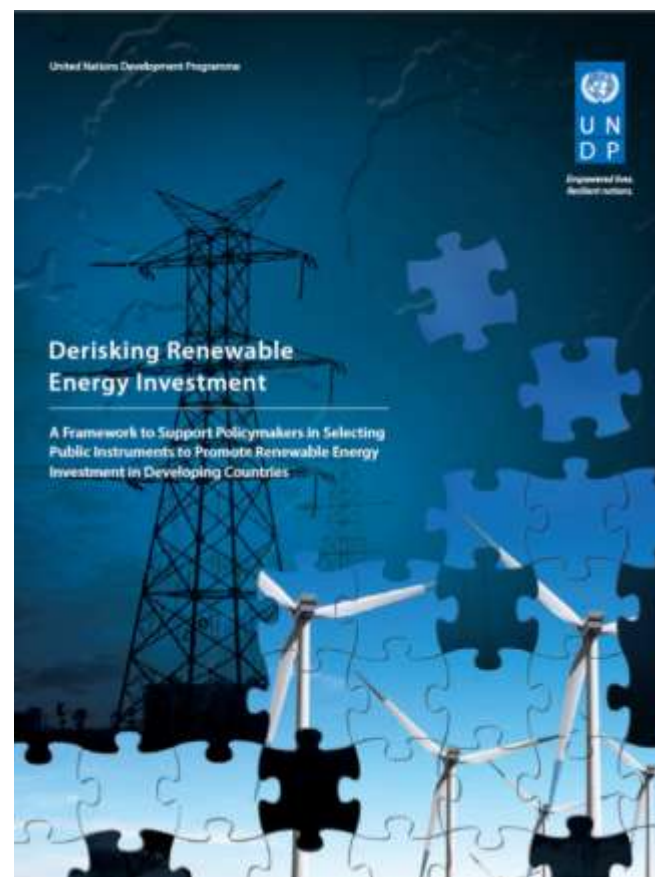
“METODOLOGÍAS Y HERRAMIENTAS DE MITIGACIÓN DEL CAMBIO CLIMÁTICO CON ESPECIAL ÉNFASIS EN EL ÁMBITO DE LA ENERGÍA Y LA AGRICULTURA”



Dos nuevos informes de PNUD sobre la promoción de energías renovable en países en desarrollo



(October 2012)



(March 2013)

Apoyo PNUD-GEF a Proyectos Transformadores de Mercados de Energías Renovables (1992-2012)

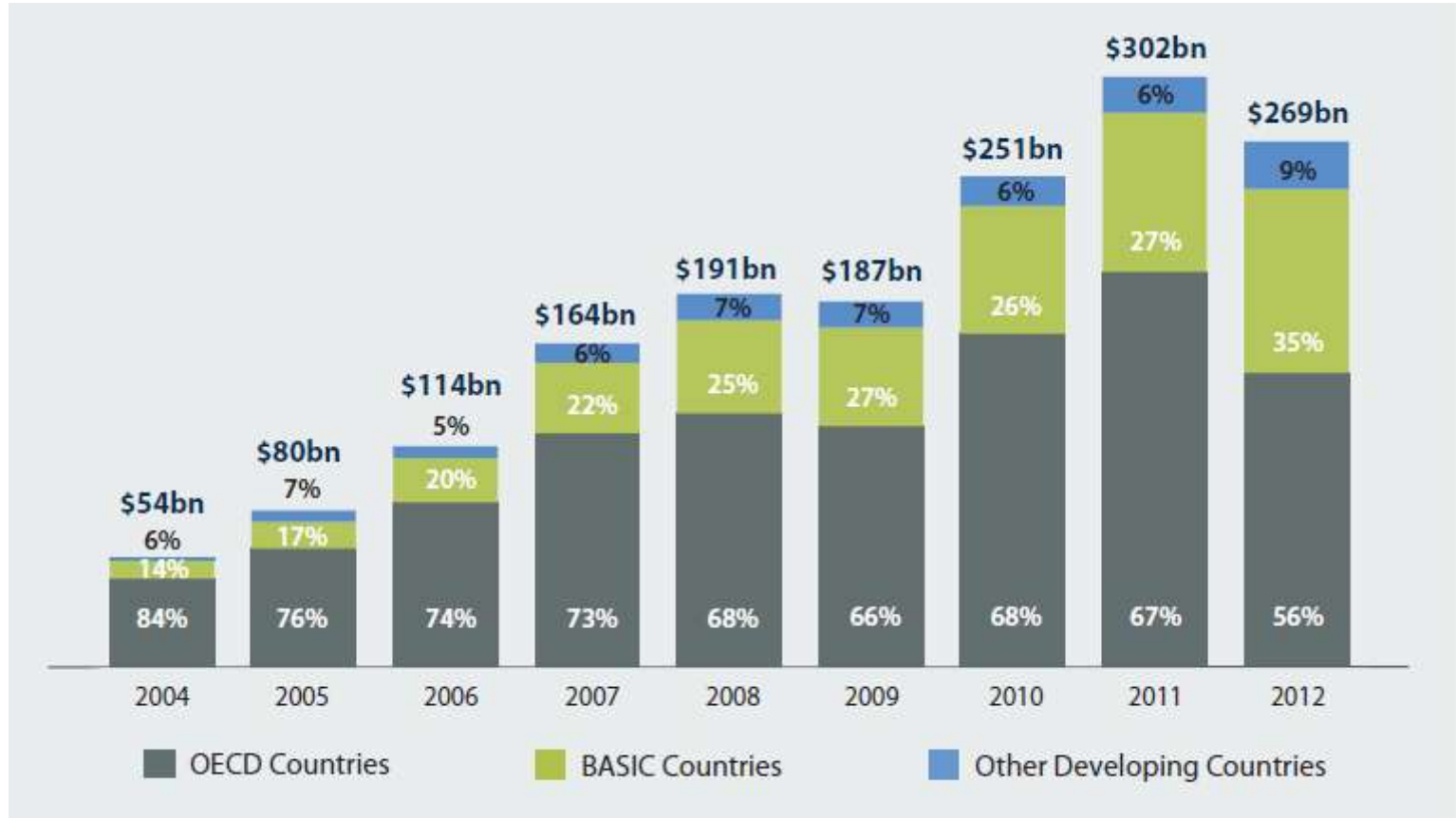


Agenda

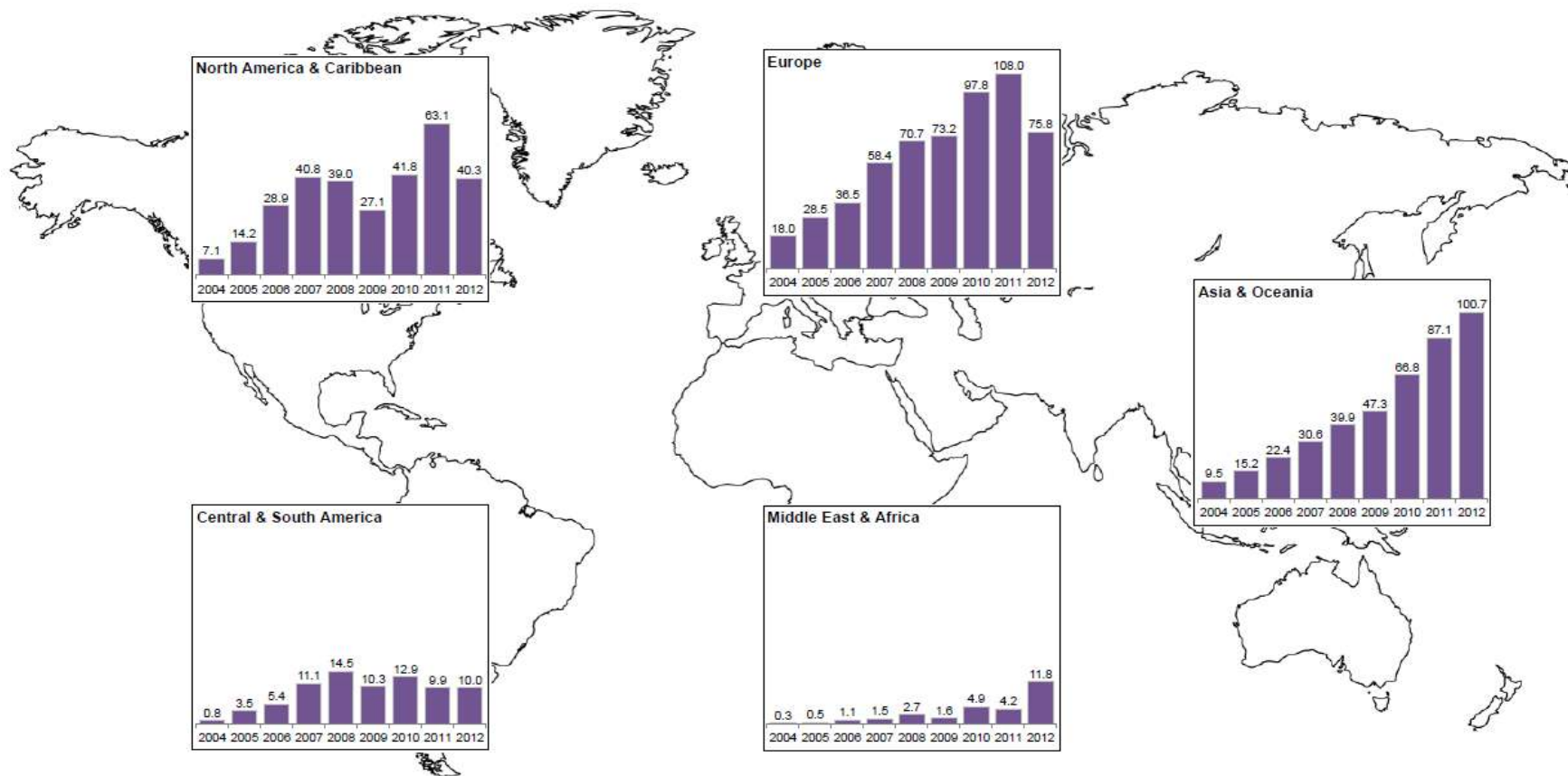
- 1: El papel de los instrumentos de acción pública en reducir los costos de financiamiento para la energía renovable
- 2: Un marco para seleccionar instrumentos de acción pública para promover la inversión en energías renovable
- 3: Un caso ilustrativo
- 4: Implicaciones para el financiamiento público para incrementar la participación de las energías renovables

Parte 1:
**El papel de los instrumentos de acción pública
en reducir los costos de financiamiento
para la energía renovable**

Inversiones globales en energías limpias



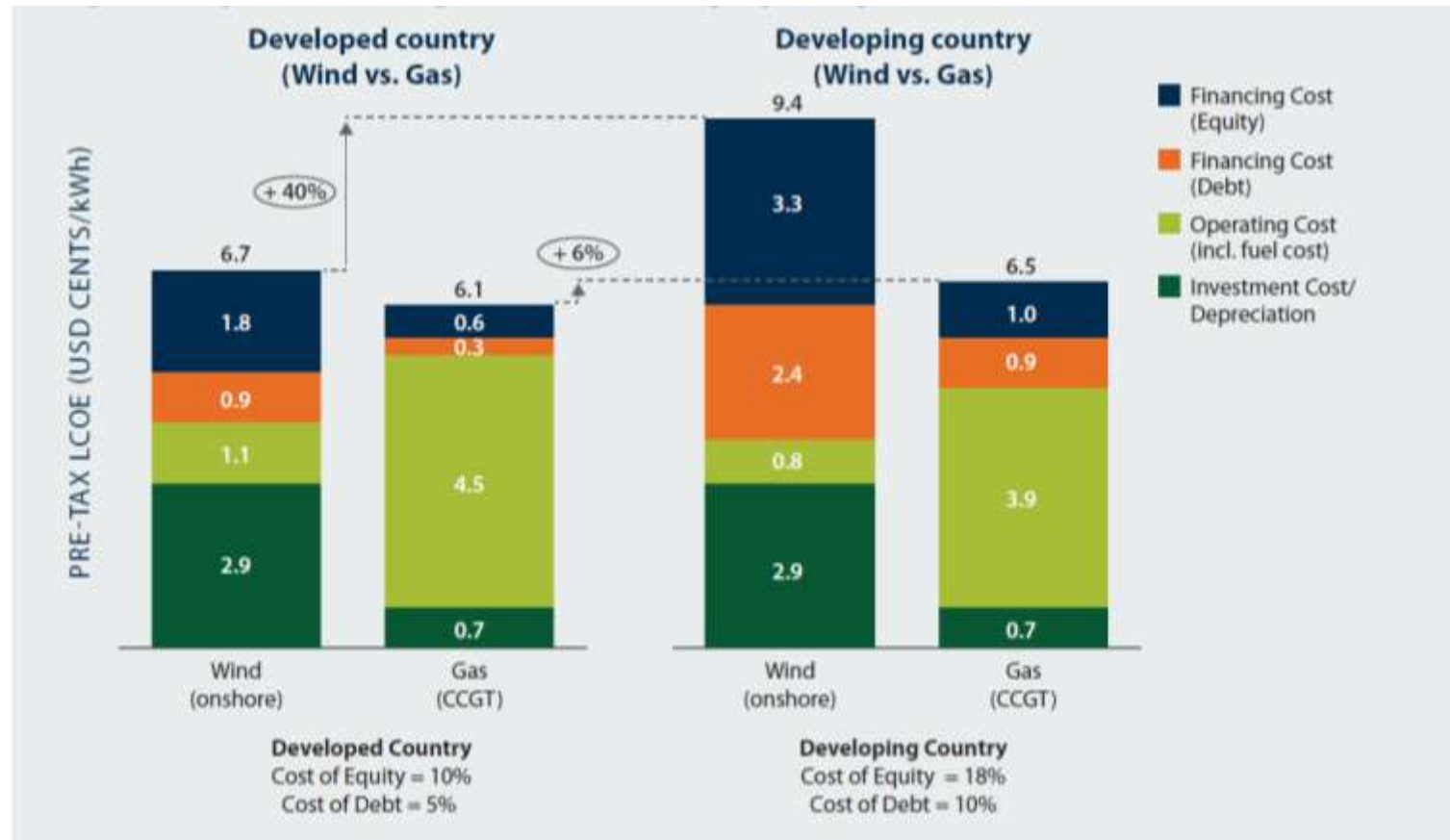
Nuevas inversiones en energía renovable por regiones 2004-2012(\$BN)



Note: Excludes corporate and government R&D

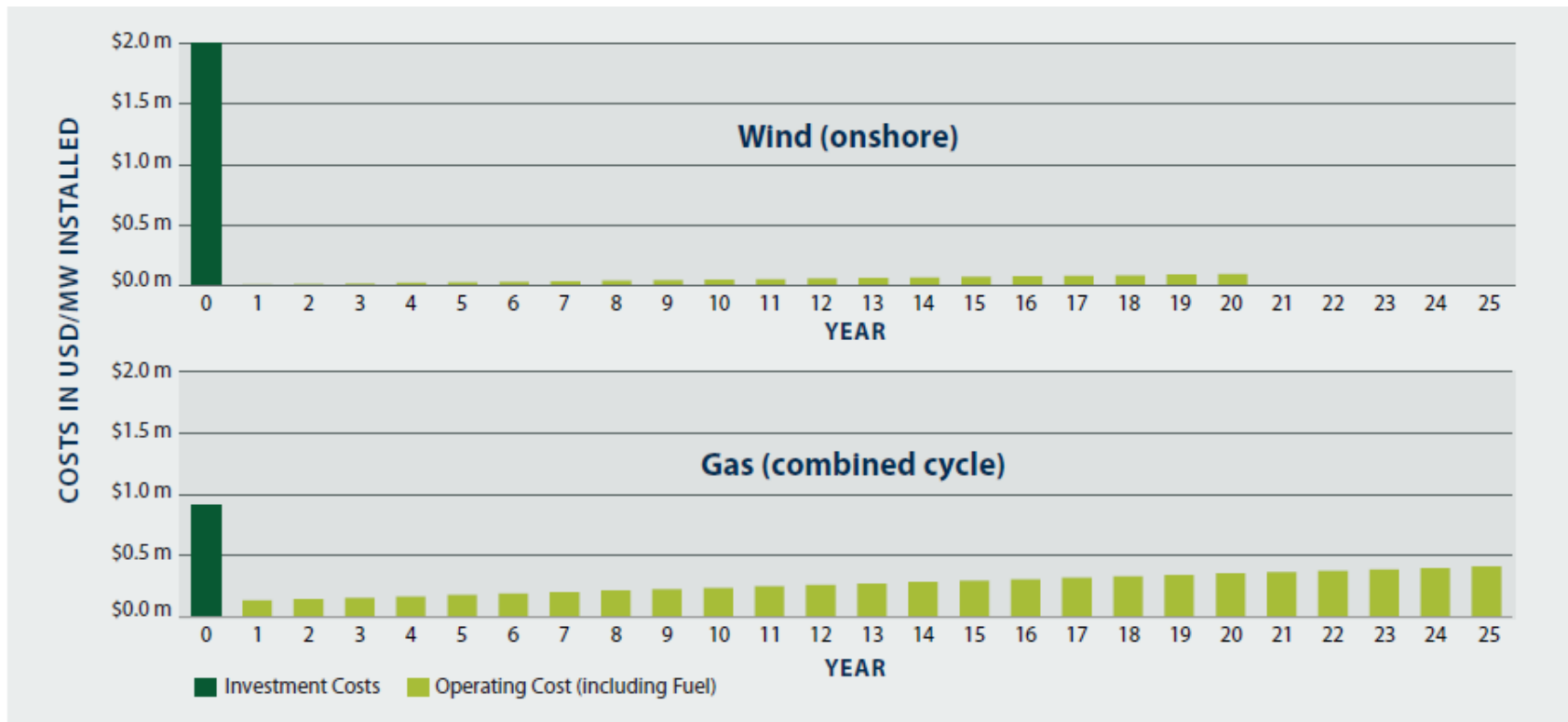
Source: Bloomberg New Energy Finance

El Costo del financiamiento para la energía renovable (eólico vs. gas)

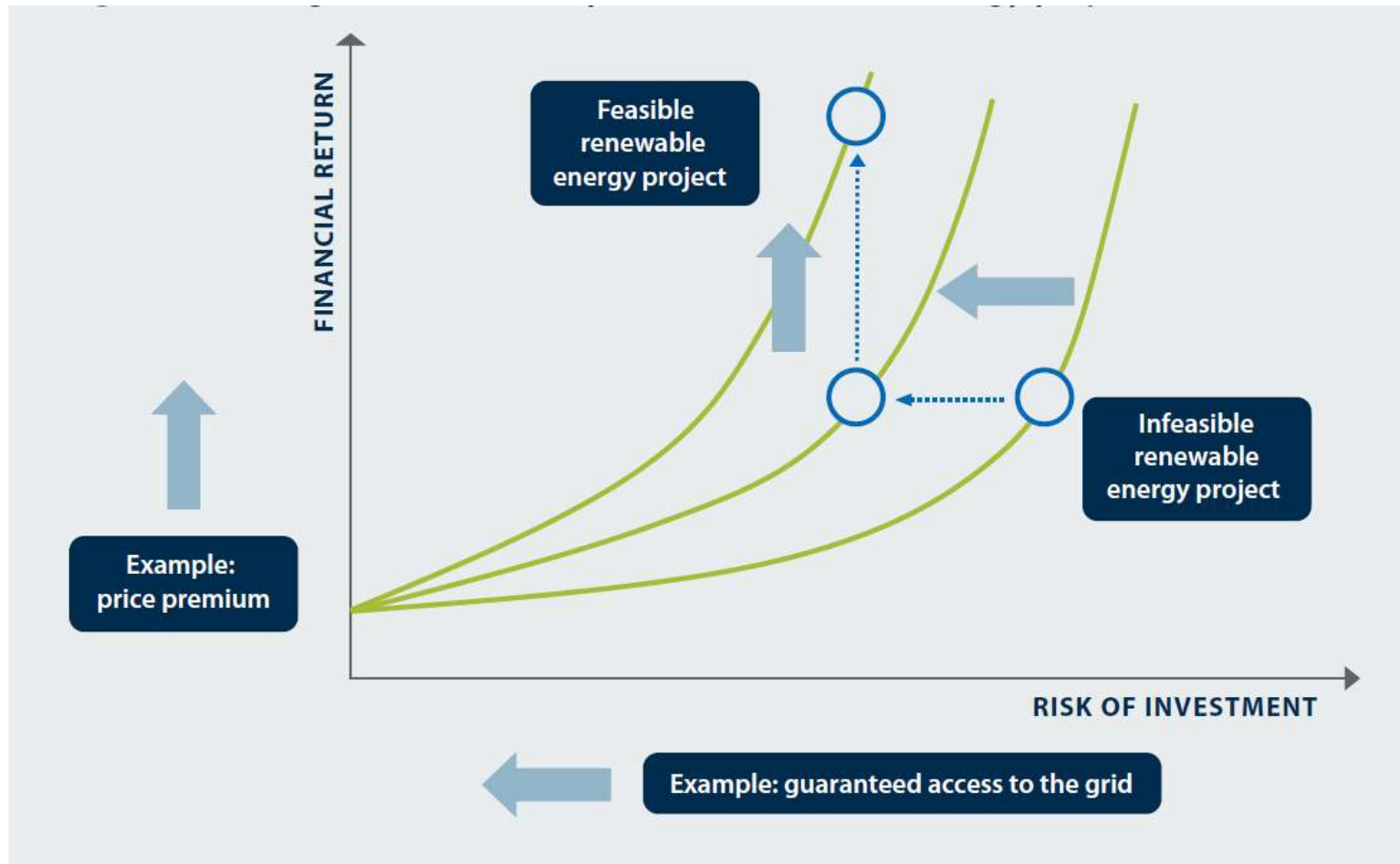


Source: UNDP, *Derisking Renewable Energy Investment (2013)*. See Annex A of the report for full assumptions.
 All assumptions (technology costs, capital structure etc.) except for financing costs are kept constant between the developed and developing country.
 Operating costs appear as a lower contribution to LCOE in developing countries due to discounting effects from higher financing costs.

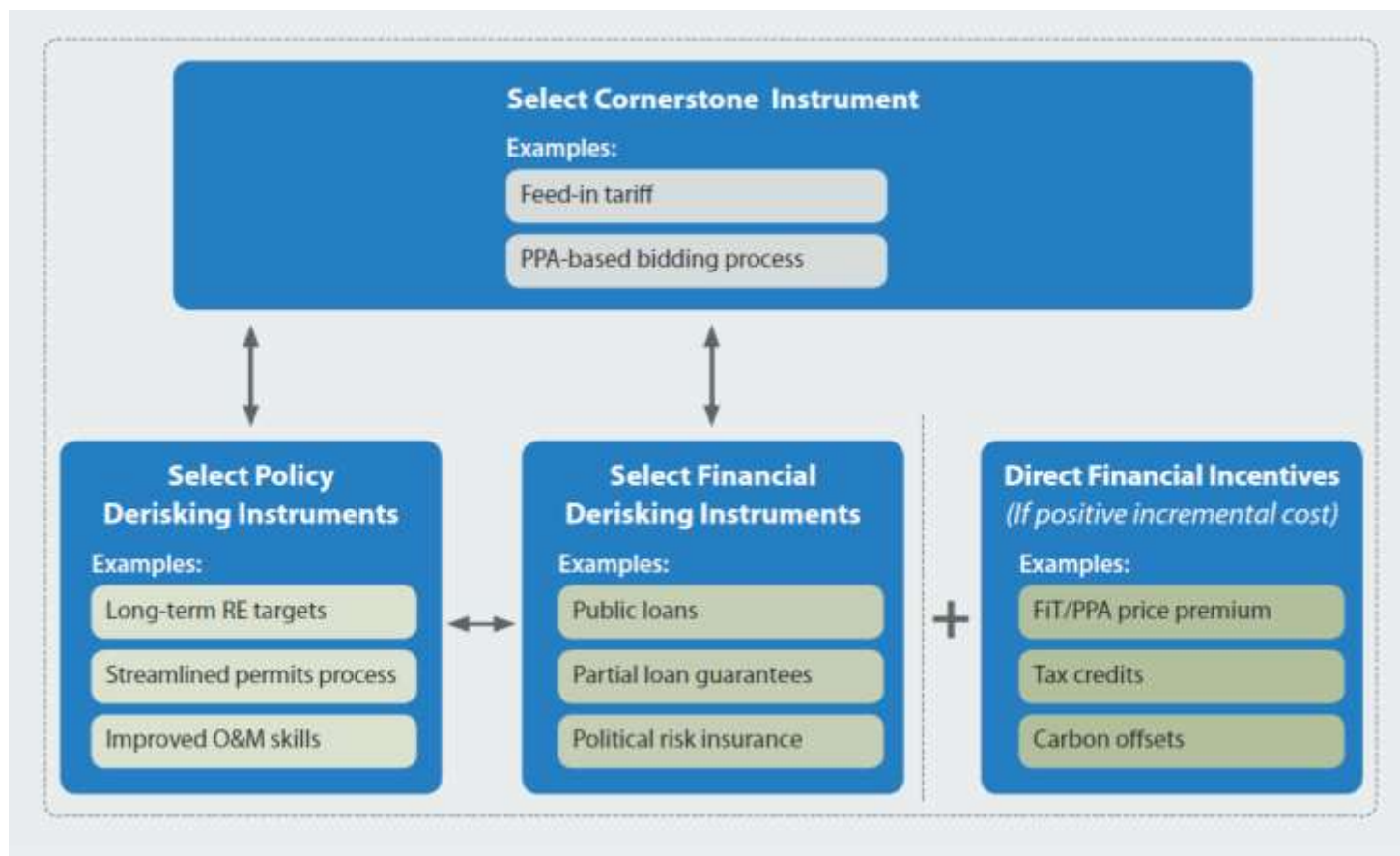
La intensidad en capital de la energía renovable



Los Instrumentos de acción pública pueden cambiar el perfil de riesgo-beneficio de las inversiones en proyectos de energía renovable



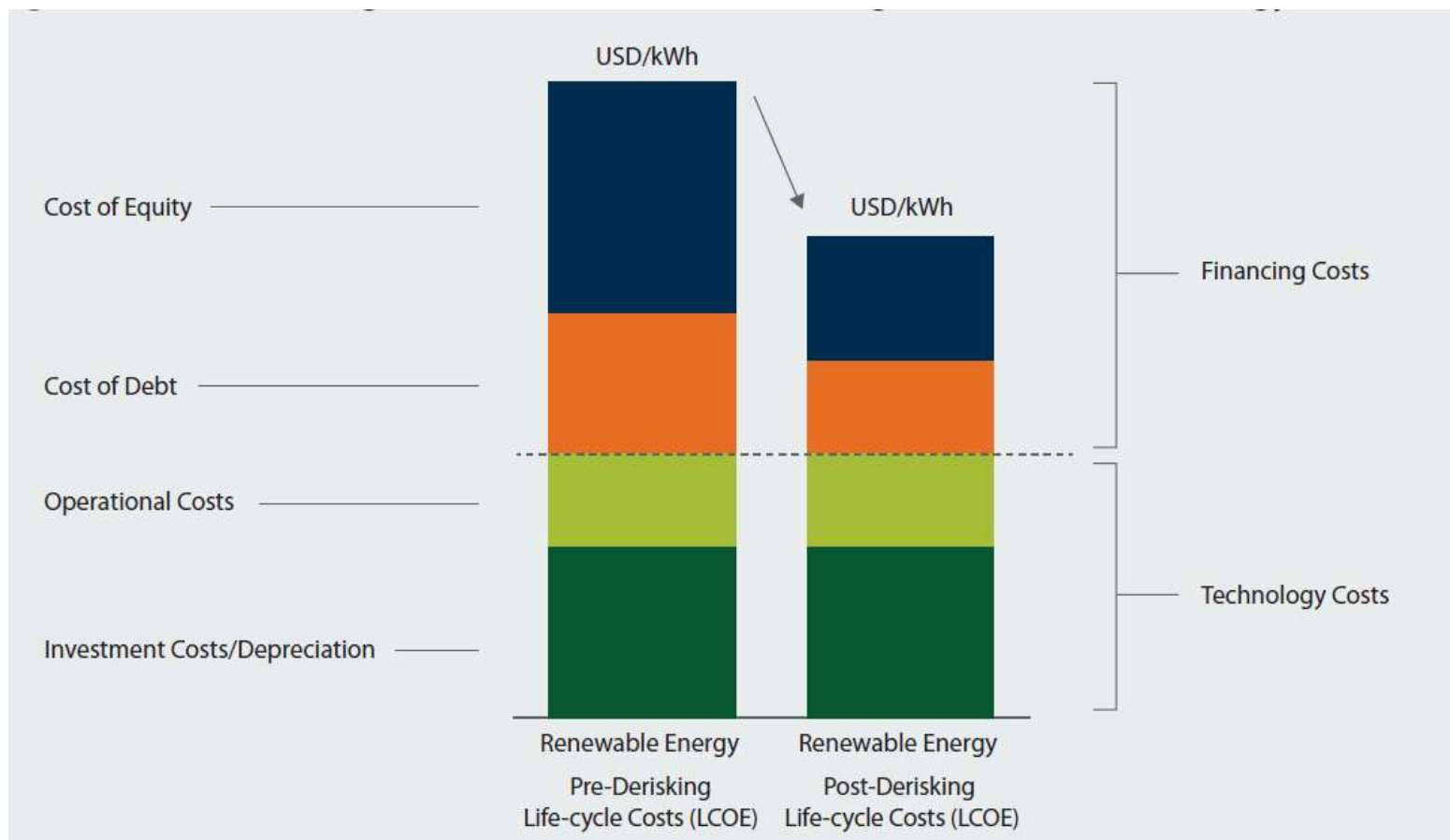
Seleccionar una mezcla de instrumentos de acción pública para catalizar las inversiones en ER



Parte 2:

Un marco para seleccionar instrumentos de acción pública para promover la inversión en energías renovable

La “teoría del cambio” detrás del marco: Reducir el costo de financiamiento para la ER



Una vista general del Marco (4 etapas): Etapa 1 y 2

Paso 1

- Establecer una tabla de barreras y riesgos multi-actores para las inversiones en energía renovable

Paso 2

- Cuantificar el impacto de las categorías de riesgos en el incremento de los costos de financiamiento

Etapa 1: Entorno de riesgo

Producto Principal :

Tabla de barreras y riesgos multi-actores

Stakeholders	Barrier	Risk Category
End-users	Barrier #1	} → Risk #1
	Barrier #2	
Supply chain	Barrier #3	} → Risk #2
	Barrier #4	

Producto Principal :

Cascadas de costos de financiamiento



Paso 1

- Seleccionar uno o más instrumentos de acción pública de atenuación de riesgos para mitigar los riesgos identificados

Paso 2

- Cuantificar el impacto del instrumento de acción pública para la atenuación de riesgos para la reducción de los costos de financiamiento
- Cuantificar el costo público del instrumento de acción pública para la atenuación de riesgos

Etapa 2: Instrumentos de acción pública

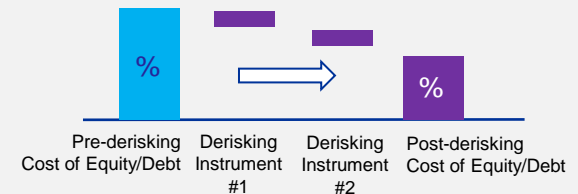
Producto Principal :

Tabla de Instrumentos de Acción Pública

Barrier	Risk Category	Policy Derisking Instrument	Financial Derisking Instrument
Barrier #1	Risk #1	Instrument #1	
Barrier #2		Instrument #2	
Barrier #3	Risk #2	Instrument #3	Instrument #1

Producto Principal :

Cascada Post atenuación de riesgo



Una vista general del Marco II(4 etapas): Etapa 3 y 4

Paso 1

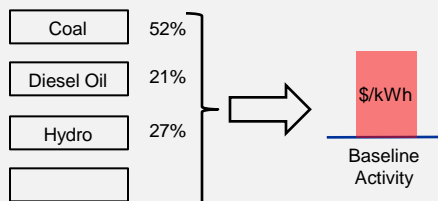
- Calcular el costo nivelado de la electricidad (LCOE) para la línea de base del mix de generación en el país.

Paso 2

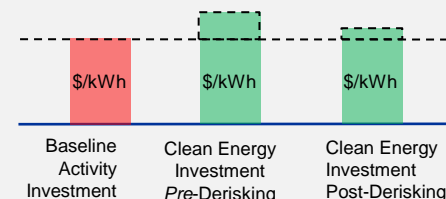
- Cuantificar el LCOE para la inversión en ER en los escenarios (i) Pre y (ii) post atenuación de
- Calcular el costo incremental (o ahorro) comparando esos escenarios con la línea de base.

Etapa 3: Costos nivelados

Producto Principal : LCOE de la línea de base



Producto Principal : Costo incremental (via LCOE)



Paso 1

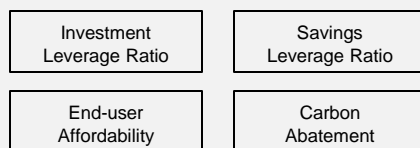
- Analizar los instrumentos de acción pública seleccionados en relación a 4 métricas de rendimiento: Ratio de apalancamiento de inversiones, ratio de apalancamiento de ahorros, asequibilidad para usuario final, abatimiento de carbono

Paso 2

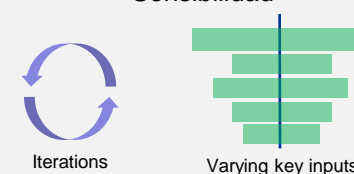
- Realizar análisis de sensibilidad sobre entradas y suposiciones claves

Etapa 4: Evaluación

Producto Principal : 4 Métricas de Rendimiento



Producto Principal : Sensibilidad



Establecer una tabla de barreras y riesgos multi-actores (Etapa1: Entorno de riesgo, Paso1)

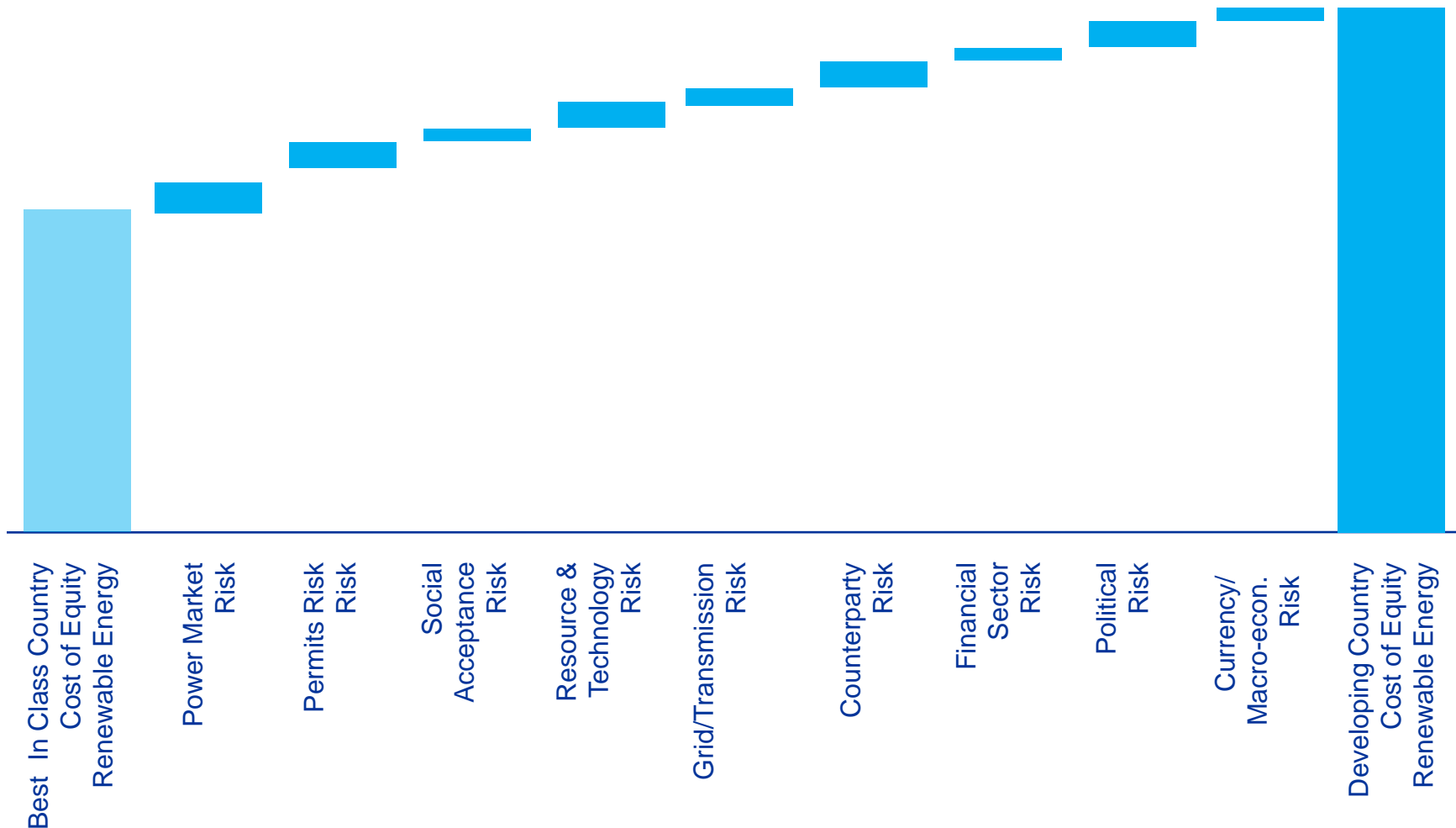
Tabla ilustrativa, 9 categorías de riesgos (i)

KEY STAKEHOLDER GROUP	BARRIERS	RISK CATEGORY	RISK DEFINITION
Public sector (legislators, policymakers)	<ul style="list-style-type: none"> Market outlook: lack of or uncertainty regarding governmental (renewable) energy strategy and targets Market access and prices: limitations related to energy market liberalization; uncertainty related to access, the competitive landscape and price outlook for renewable energy; limitations in design of standard PPAs and/or PPA tendering procedures Market distortions: such as high fossil fuel subsidies 	1. Power Market Risk	Risk arising from limitations and uncertainties in the power market, and/or suboptimal regulations to address these limitations and promote renewable energy markets
Public sector (administrators)	<ul style="list-style-type: none"> Labor-intensive, complex processes and long time-frames for obtaining licenses and permits (generation, EIAs, land title) for renewable energy projects High levels of corruption. No clear recourse mechanisms 	2. Permits Risk	Risk arising from the public sector's inability to efficiently and transparently administer renewable energy-related licensing and permits.
End-users, general public	<ul style="list-style-type: none"> Lack of awareness on renewable energy amongst consumers, end-users and local residents Social and political resistance related to renewable energy NIMBY concerns, special interest groups 	3. Social Acceptance Risk	Risks arising from lack of awareness and resistance to renewable energy in communities and end-users
Project developers, supply chain	<ul style="list-style-type: none"> For resource assessment and supply: inaccuracies in early-stage assessment of renewable energy resource; where applicable (e.g. bioenergy), uncertainties related to future supply and cost of resource For planning, construction, operations and maintenance: suboptimal plant design; lack of local firms offering construction, maintenance services; lack of skilled and experienced local staff; uncertainties related to securing land and limitations in civic infrastructure (roads etc.) For the purchase and, if applicable, local manufacture of hardware: purchaser's lack of information on quality, reliability and cost of hardware; lack of local industrial presence and experience with hardware, including skilled and experienced local workforce 	4. Resource & Technology Risk	Risks arising from uncertainties regarding renewable energy resource and technology (resource assessment; construction and operational use; hardware purchase and manufacturing)

KEY STAKEHOLDER GROUP	BARRIERS	RISK CATEGORY	RISK DEFINITION
Utility (transmission company/grid operator)	<ul style="list-style-type: none"> Grid code and management: limited experience or suboptimal operational track-record of grid operator with intermittent sources (e.g. grid management and stability). Lack of standards for the integration of intermittent, renewable energy sources into the grid Transmission infrastructure: inadequate or antiquated grid infrastructure, including lack of transmission lines from the renewable energy source to load centres; uncertainties for construction of new transmission infrastructure 	5. Grid/ Transmission Risk	Risks arising from limitations in grid management and transmission infrastructure in the particular country
Utility (electricity purchaser)	<ul style="list-style-type: none"> Limitations in the utility's (electricity purchaser) credit quality, corporate governance, management and operational track-record or outlook; unfavourable policies regarding utility's cost-recovery arrangements 	6. Counterparty Risk	Risks arising from the utility's poor credit quality and an IPP's reliance on payments
Investors (equity and debt)	<ul style="list-style-type: none"> Capital scarcity: Limited availability of local or international capital (equity/and or debt) for green energy infrastructure due to, for example: under-developed local financial sector; policy bias against investors in green energy Limited experience with renewable energy: Lack of information, assessment skills and track-record for renewable energy projects amongst investor community; lack of network effects (investors, investment opportunities) found in established markets; lack of familiarity and skills with project finance structures 	7. Financial Sector Risk	Risks arising from general scarcity of investor capital (debt and equity) in the particular country, and investors' lack of information and track record on renewable energy
National Level	<ul style="list-style-type: none"> Uncertainty or impediments due to war, terrorism, and/or civil disturbance Uncertainty due to high political instability; poor governance; poor rule of law and institutions Uncertainty or impediments due to government policy (currency restrictions, corporate taxes) 	8. Political Risk	Risks arising from country-specific governance and legal characteristics
National Level	<ul style="list-style-type: none"> Uncertainty due to volatile local currency; unfavorable currency exchange rate movements Uncertainty around inflation, interest rate outlook: due to an unstable macro-economic environment 	9. Currency/ Macro- economic Risk	Risks arising from the country's macro-economic performance

Cuantificar el impacto de las categorías de riesgos en el incremento de los costos de financiamiento

(Etapas 1 y 2) **Entorno de riesgo, Paso 2)** Comparative Cost of Equity, Low or Large-scale, on grid renewable energy



Seleccionar Instrumentos de acción pública (Etapa 2: Instrumentos de acción pública , Paso 1)



Public instrument table for renewable energy (Part 1)

BARRIERS				MENU OF SELECTED PUBLIC INSTRUMENTS			
RISK CATEGORY	DESCRIPTION	UNDERLYING BARRIERS	KEY STAKEHOLDER GROUP	POLICY DERISKING INSTRUMENTS		FINANCIAL DERISKING INSTRUMENTS	
				ACTIVITY	DESCRIPTION	ACTIVITY	DESCRIPTION
1. Power Market Risk	Risk arising from limitations and uncertainties in the energy market, and/or sub-optimal regulations to address these limitations and promote renewable energy markets	<ul style="list-style-type: none"> Market outlook: lack of or uncertainties regarding governmental renewable energy strategy and targets 	Public sector (policymakers, legislators, regulators)	Establish transparent, long-term national renewable energy strategy and targets	National-level resource inventory/ mapping; establish national energy office; review technology options; renewable energy target formulation (as part of national energy planning)		
		<ul style="list-style-type: none"> Market access and prices: limitations related to energy market liberalization; uncertainty related to access, the competitive landscape and price outlook for renewable energy; limitations in design of standard PPAs and/or PPA tendering procedures 		Establish a harmonized, well-regulated and unbundled energy market, with cornerstone instruments to address price and market-access risk for renewable energy projects	Unbundling of the energy market (generation, transmission, distribution); establish well-designed and transparent procedures for FIT, PPA tendering (or similar); well-designed, transparent policy on key clauses* for standard PPA		
		<ul style="list-style-type: none"> Market distortions: such as high fossil fuel subsidies 		Reform of fossil fuel subsidies	Assessment of fuel subsidies; phase-out/down of subsidies; awareness campaigns; design of transfer programs to vulnerable social groups		
2. Permits Risk	Risk arising from the public sector's inability to efficiently and transparently administer renewable energy-related licensing and permits	<ul style="list-style-type: none"> Labour-intensive, complex processes and long time-frames for obtaining licences and permits (generation, EIAs, land title) for renewable energy projects 	Public sector (administrators)	Establish a one-stop-shop for renewable energy permits; streamline processes for permits	Establish institutional champion with clear accountability and appropriate expertise for renewable energy; harmonisation of requirements; reduction of process steps; training of staff in renewable energy		
		<ul style="list-style-type: none"> High levels of corruption. No clear recourse mechanisms 		Contract enforcement and recourse mechanisms	Enforce transparent practices, renewable energy related corruption control and fraud avoidance mechanisms; establish effective recourse mechanisms		
3. Social Acceptance Risk	Risks arising from lack of awareness and resistance to renewable energy in communities and end-users	<ul style="list-style-type: none"> Lack of awareness of wind energy amongst consumers, end-users, and local residents 	End-users, general public	Awareness-raising campaigns targeting communities and end-users	Awareness campaigns, stakeholder dialogue and workshops with end-users, policymakers, and local residents.		
		<ul style="list-style-type: none"> Social and political resistance related to NIMBY concerns, special interest groups 		Pilot models for community involvement at project sites	Community consultations including piloting models, such as in-kind services (energy access, local employment, etc.) or equity stakes in renewable energy projects		
4. Resource & Technology Risk	Risks arising from use of the renewable energy resource and technology (resource assessment; construction and operational use; hardware purchase and manufacturing)	<ul style="list-style-type: none"> For resource assessment and supply: inaccuracies in early-stage assessment of renewable energy resource; where applicable (e.g. bioenergy), uncertainties related to future supply and cost of resource 	Project developers, supply chain	Project development facility: capacity building for resource assessment	Dissemination of top-level, national resource assessment findings; grant funding for on-site resource assessment (depending on technology); capacity building for resource assessment.		
		<ul style="list-style-type: none"> For planning, construction, operations and maintenance: uncertainties related to securing land; sub-optimal plant design; lack of local firms offering construction, maintenance services; lack of skilled and experienced local staff; limitations in civil infrastructure (roads etc.) 		Project development facility: feasibility studies; networking; training and qualifications	Industry conferences; grant funding for pre-feasibility studies (depending on technology); training, apprenticeships and university programmes to build skills (planning, construction, O&M).		
		<ul style="list-style-type: none"> For the purchase and, if applicable, local manufacture of hardware: purchaser's lack of information on quality, reliability and cost of hardware; lack of local industrial presence and experience with hardware, including skilled and experienced local workforce 		Research and development; technology standards; exchange of market information (e.g. via trade fairs)	Test centre for research and development into long-term quality of equipment; standards, testing and certification; awareness campaigns and trade fairs	Financial products by development banks to assist manufacturers in gaining access to capital/funding	Depends on specific financial circumstances. Can include as necessary: public loans; public loan guarantees; public equity

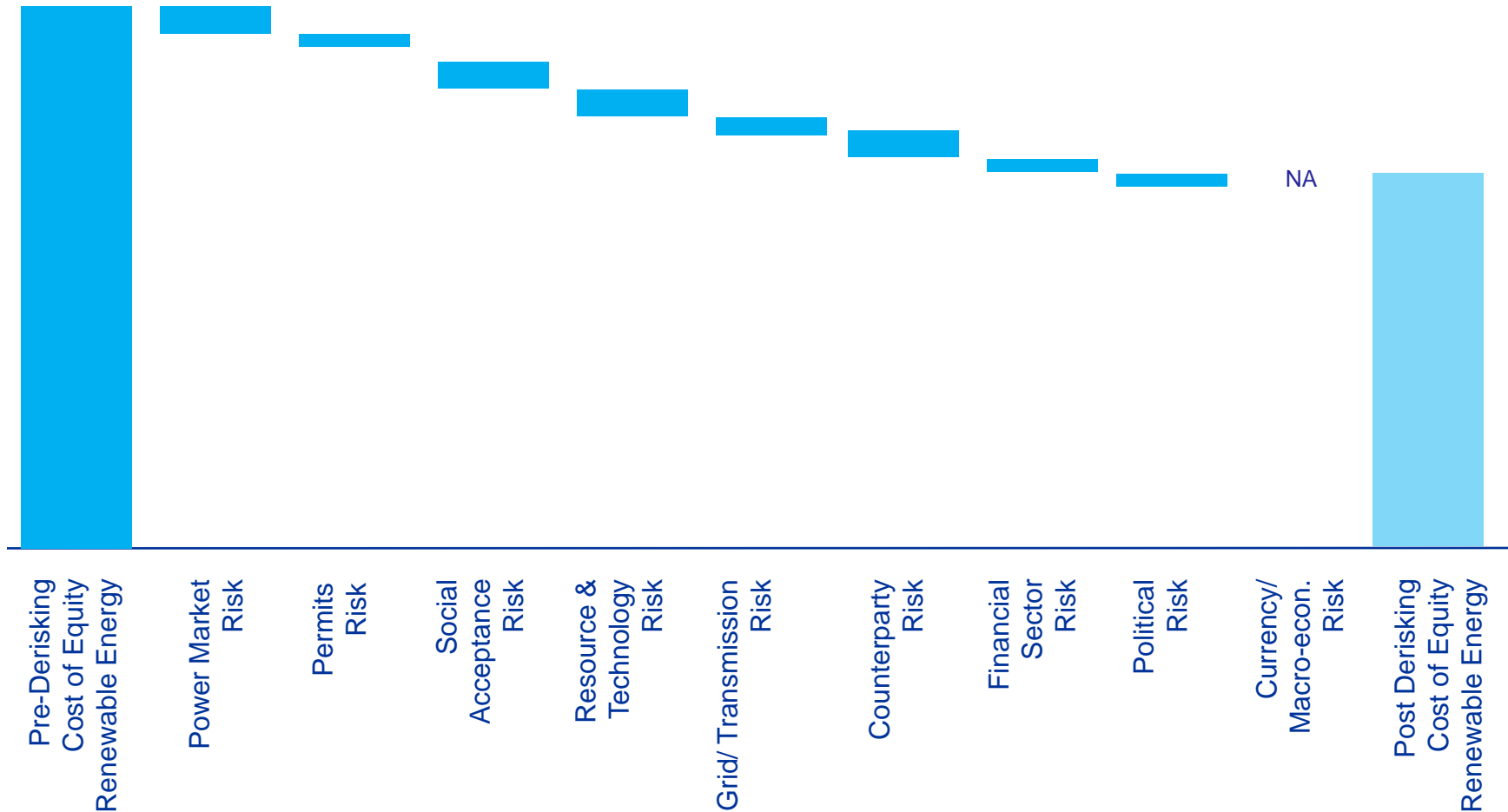
Public instrument table for renewable energy (Part 2)

RISK CATEGORY	DESCRIPTION	BARRIERS		MENU OF SELECTED PUBLIC INSTRUMENTS			
		UNDERLYING BARRIERS	KEY STAKEHOLDER GROUP	POLICY DERISKING INSTRUMENTS		FINANCIAL DERISKING INSTRUMENTS	
				ACTIVITY	DESCRIPTION	ACTIVITY	DESCRIPTION
5. Grid/Transmission Risk	Risks arising from limitations in grid management and transmission infrastructure in the particular country	<ul style="list-style-type: none"> <i>Grid code and management:</i> limited experience or suboptimal operational track-record of grid operator with intermittent sources (e.g. grid management and stability). Lack of standards for the integration of intermittent, renewable energy sources into the grid 	Utility (transmission company, grid operator)	Strengthen transmission company's operational performance, grid management and formulation of grid code	Develop a grid code for new renewable energy technologies; sharing of international best practice in grid management		
		<ul style="list-style-type: none"> <i>Transmission infrastructure:</i> inadequate or antiquated grid infrastructure, including lack of transmission lines from the renewable energy source to load centres; uncertainties for construction of new transmission infrastructure 		Policy support for national grid infrastructure development	Develop a long-term national transmission/grid road-map to include intermittent renewable energy	Financial products by development banks to assist transmission companies in gaining access to capital/funding	Depends on specific financial circumstances. Can include as necessary: public loans; public loan guarantees; public equity
6. Counterparty Risk	Risks arising from the utility's poor credit quality and an IPP's reliance on payments	<ul style="list-style-type: none"> Limitations in the utility's (electricity purchaser) credit quality, corporate governance, management and operational track-record or outlook; unfavourable policies regarding utility's cost-recovery arrangements 	Utility (electricity purchaser)	Strengthen utility/distribution company's performance	Establish international best practice in utility/distribution company's management, operations and corporate governance; implement sustainable cost recovery policies	Government guarantees or backing for PPA payments; counterparty guarantees offered by development banks	Depends on specific circumstances and division of risks in PPA. Can include, as necessary: partial risk guarantees on PPA; counterparty guarantees as part of political risk insurance (PRI)
7. Financial Sector Risk	Risks arising from general scarcity of investor capital (debt and equity) in the particular country, and investors' lack of information and track record on renewable energy	<ul style="list-style-type: none"> <i>Capital scarcity:</i> Limited availability of local or international capital (equity/and or debt) for green infrastructure due to, for example: under-developed local financial sector; policy bias against investors in green energy 	Investors (equity and debt)	Financial sector policy reforms	Assess trade-offs between financial stability regulation and renewable energy objectives (e.g. liquidity treatment); promote financial sector policy favorable to long-term infrastructure, including project finance	Financial products by development banks to assist project developers to gain access to capital/funding	Depends on specific financial circumstances. Can include as necessary: public loans; public loan guarantees; public equity
		<ul style="list-style-type: none"> <i>Limited experience with renewable energy:</i> Lack of information, assessment skills and track-record for renewable energy projects amongst investor community; lack of network effects (investors, investment opportunities) found in established markets; lack of familiarity and skills with project finance structures 		Strengthen investors' (debt and equity) familiarity with and capacity regarding renewable energy projects	Industry-finance dialogues and conferences; workshops/training on project assessment and financial structuring (project finance); public-private partnership building		
8. Political Risk	Risks arising from country-specific governance and legal characteristics	<ul style="list-style-type: none"> Uncertainty or impediments due to war, terrorism, and/or civil disturbance 	National level			Risk sharing products by development banks to address political risk	Provision of political risk insurance (PRI) covering (i) expropriation, (ii) political violence, (iii) currency restrictions
		<ul style="list-style-type: none"> Uncertainty due to high political instability; poor governance; poor rule of law and institutions 					
		<ul style="list-style-type: none"> Uncertainty or impediments due to government policy (currency restrictions, corporate taxes) 					
9. Currency/Macro-economic Risk	Risks arising from the broader macro-economic environment and market dynamics	<ul style="list-style-type: none"> Uncertainty due to volatile local currency; unfavourable currency exchange rate movements Uncertainty around inflation, interest rate outlook due to an unstable macro-economic environment 	National level	<p><i>Private sector instruments, such as hedging for currency risk or interest rate swaps, are commonly used to address this risk category but are not shown in this public instrument table.</i></p>			

Cuantificar el impacto del instrumento de acción pública en los costos de financiamiento

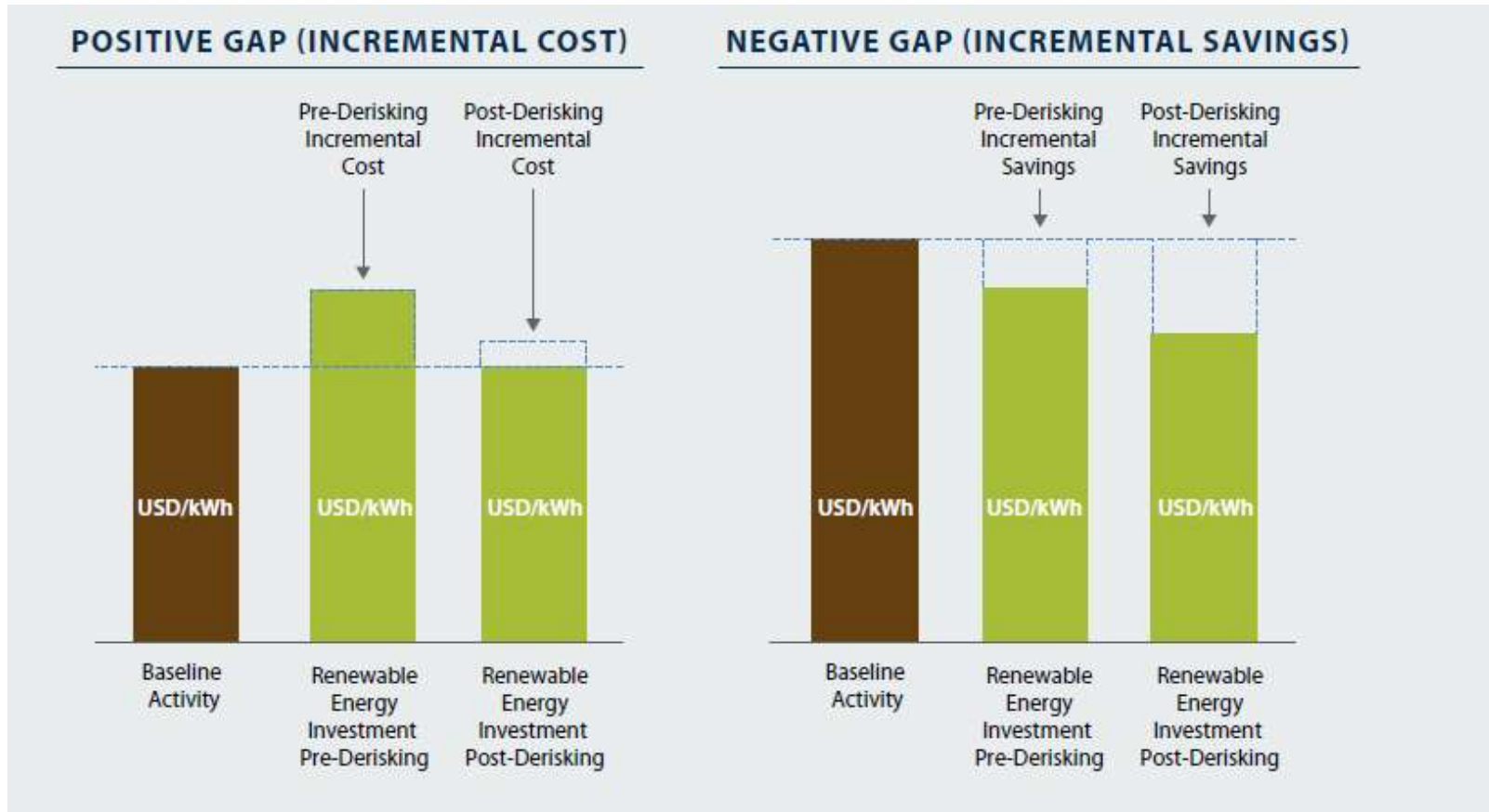
(Etapa 2: Instrumentos de acción pública , Paso 2)

Illustrative impact of public instruments on cost of equity breakdown for large-scale, on grid renewable energy

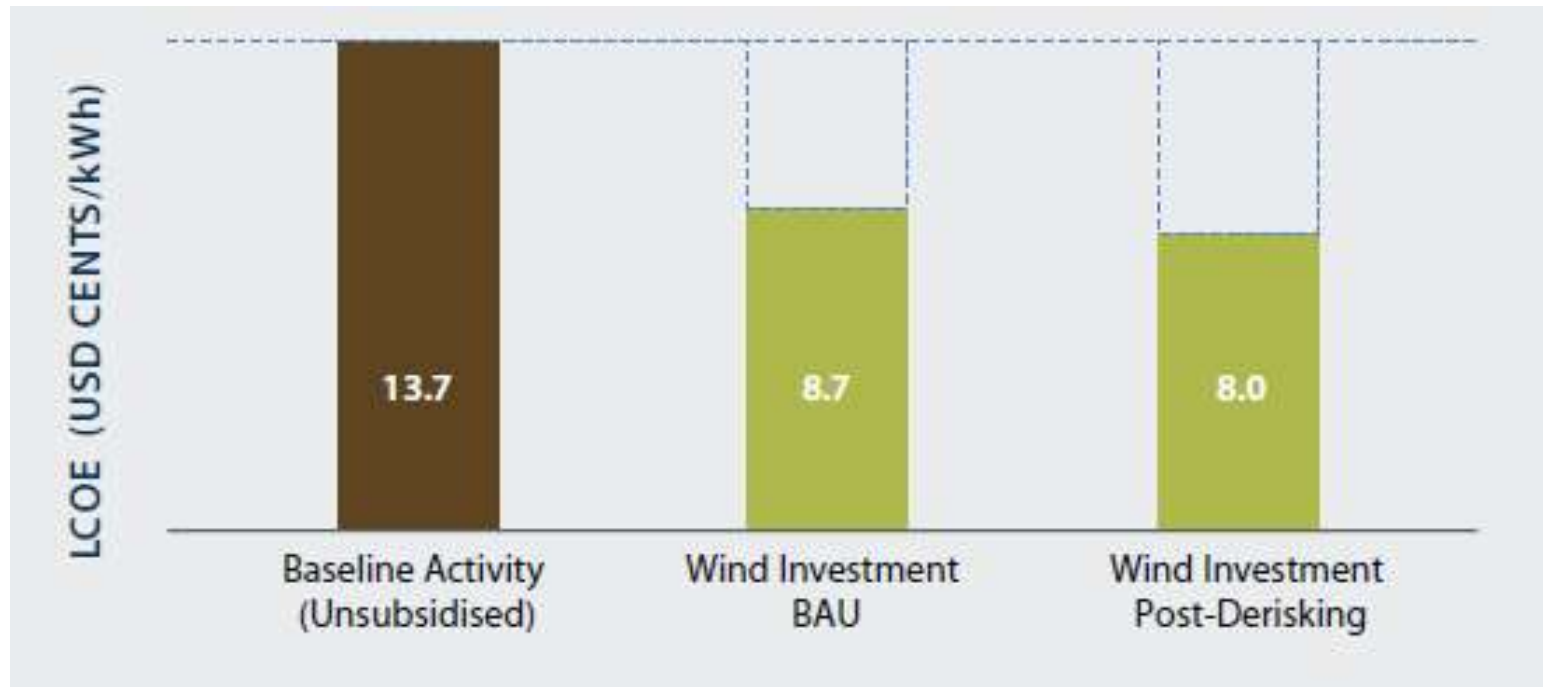


Source: UNDP, *Derisking Renewable Energy Investment (2013)*. Adapted from the risk waterfall concept originally developed by DB Climate Change Advisors. Currency macro-economic risk is marked "NA" as the scope of the framework is linked to public derisking instruments.

Calcular LCOEs para la línea de base y la energía renovable seleccionada (Etapa 3: LCOE, Paso 1+2)



Costo nivelado de la generación de electricidad (LCOE) Panamá

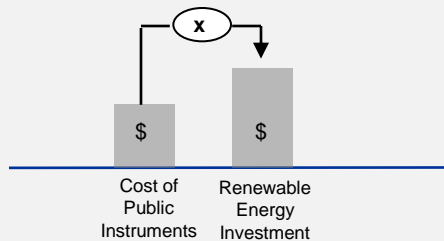


Analizar los instrumentos de acción pública seleccionados vía 4 métricas de rendimiento

(Etapa 4: Evaluación, Paso 1)

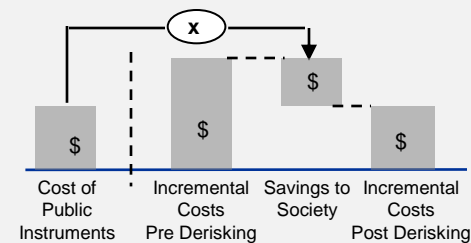
Output Metric 1: *Ratio de apalancamiento de inversiones*

En un sector, comparar el costo total (US\$) de todos los instrumentos de AP desplegados versus la inversión (US\$) del sector privado resultante.



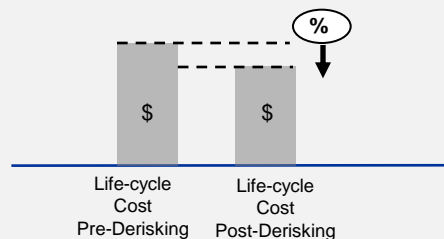
Output Metric 2: *Ratio de apalancamiento de ahorros*

En un sector, comparar el costo total (US\$) de todos los instrumentos de AP desplegados versus los ahorros económicos resultantes.



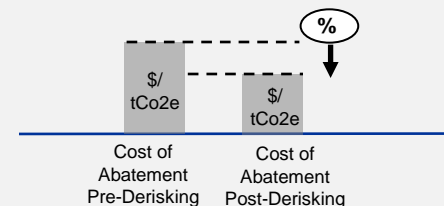
Output Metric 3: *Asequibilidad para el usuario final*

Comparar los costo del ciclo de vida de la ER en los escenarios Pre versus (ii) post atenuación de riesgos.



Output Metric 4: *Abatimiento de carbono*

En un sector, evaluar el costo incremental de inversión en ER sobre la línea de base en término de abatimiento de carbono



Analisis de sensibilidad

(Etapa 4: Evaluación, Paso 1)

Key Drivers for Sensitivity Analyses

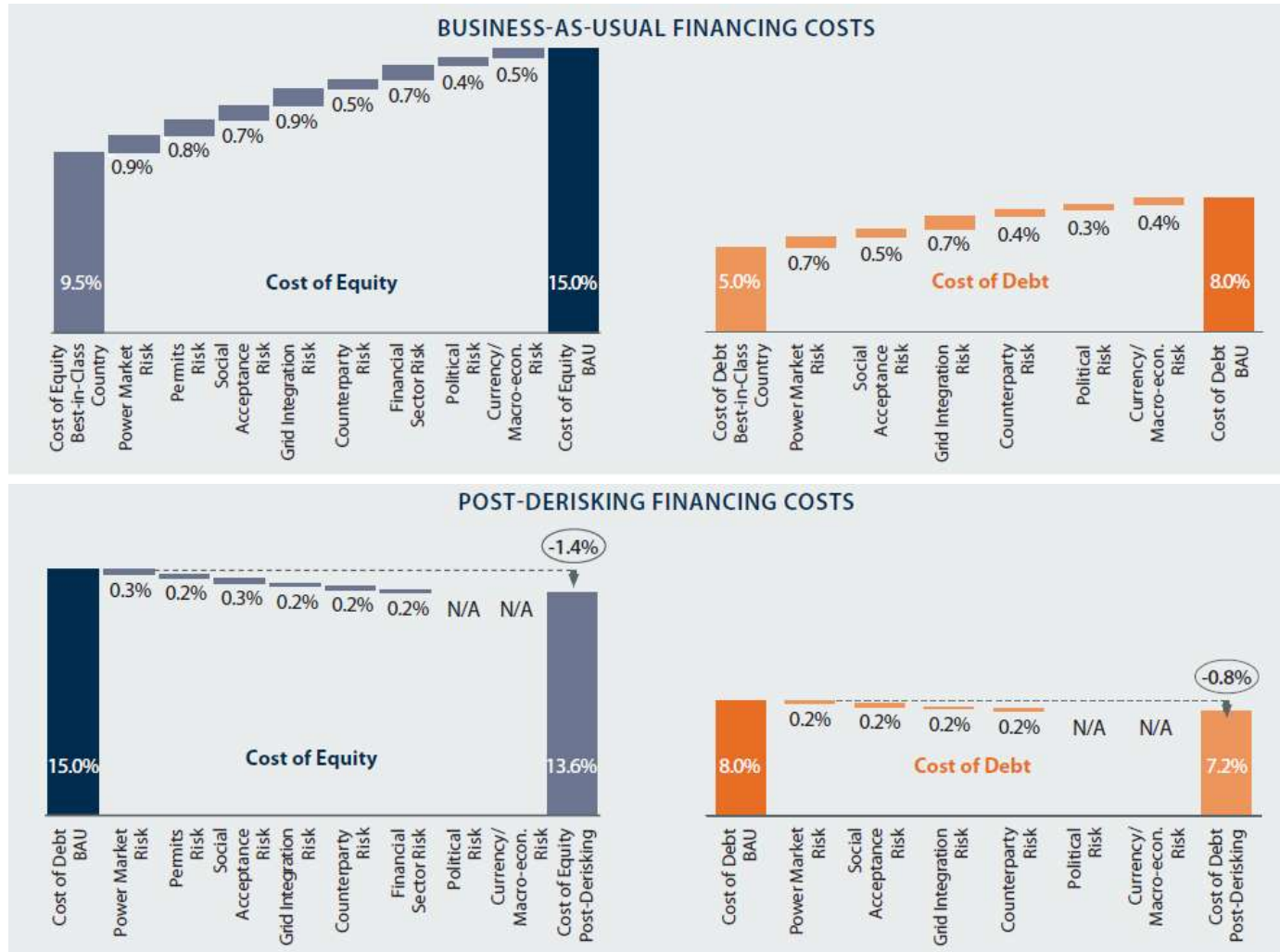
Stage 1:	Risk Environment	<ul style="list-style-type: none"> • Best-in-class country selection 	
Stage 2:	Public Instruments	<ul style="list-style-type: none"> • Public instrument effectiveness (impact on cost of debt & equity, capital structure, loan tenors) • Public instrument timing effects • Cost of financial derisking instruments (including [paid-in-capital leveraging]) • Cost of policy derisking instruments 	
Stage 3:	Levelised Cost	<p>Baseline LCOE</p> <ul style="list-style-type: none"> • Existing vs. marginal baseline • Energy mix <ul style="list-style-type: none"> ◦ Investment costs, O&M costs ◦ Fuel costs (unsubsidised vs. subsidised, market projections) ◦ Capacity factor ◦ Financing (cost of debt & equity, capital structure, loan tenors) 	<p>Wind LCOE</p> <ul style="list-style-type: none"> • Investment costs • Capacity factor • Financing (cost of debt & equity, capital structure, loan tenors)
	General	<ul style="list-style-type: none"> • Public sector discount rate • Tax rates • Depreciation 	

Parte 3:

Un caso ilustrativo

Modelo Ilustrativo

Panamá (1 GW, eólico) Cascadas de riesgos

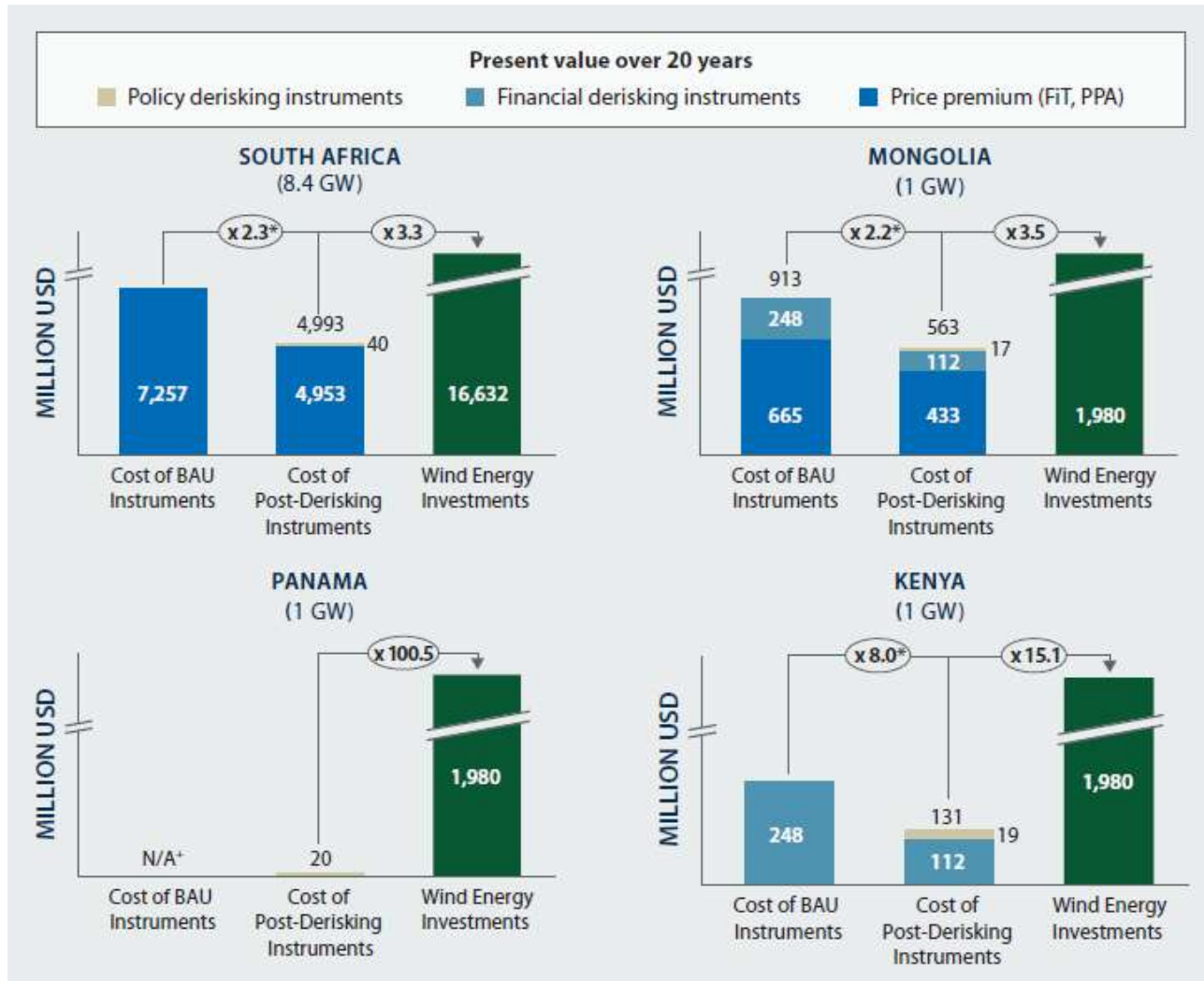


Source: UNDP, *Derisking Renewable Energy Investment (2013)*. Data obtained from interviews with wind investors and developers. See Annex A of the report for full assumptions. The post-derisking cost of debt and equity show the average impacts over a 20 year modelling period, assuming linear timing effects.

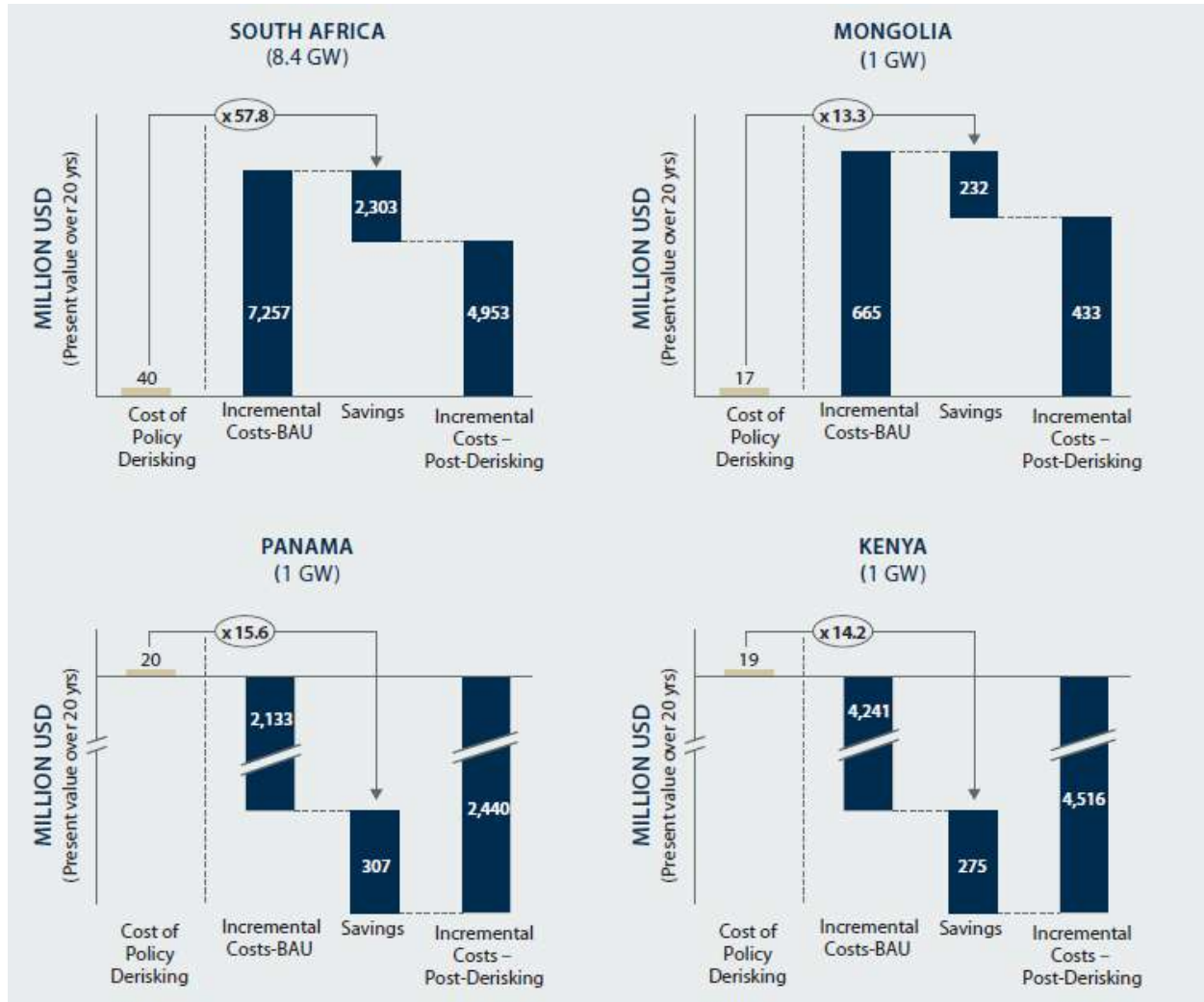
Parte 4:

Implicaciones para el financiamiento público para incrementar la participación de las energías renovables

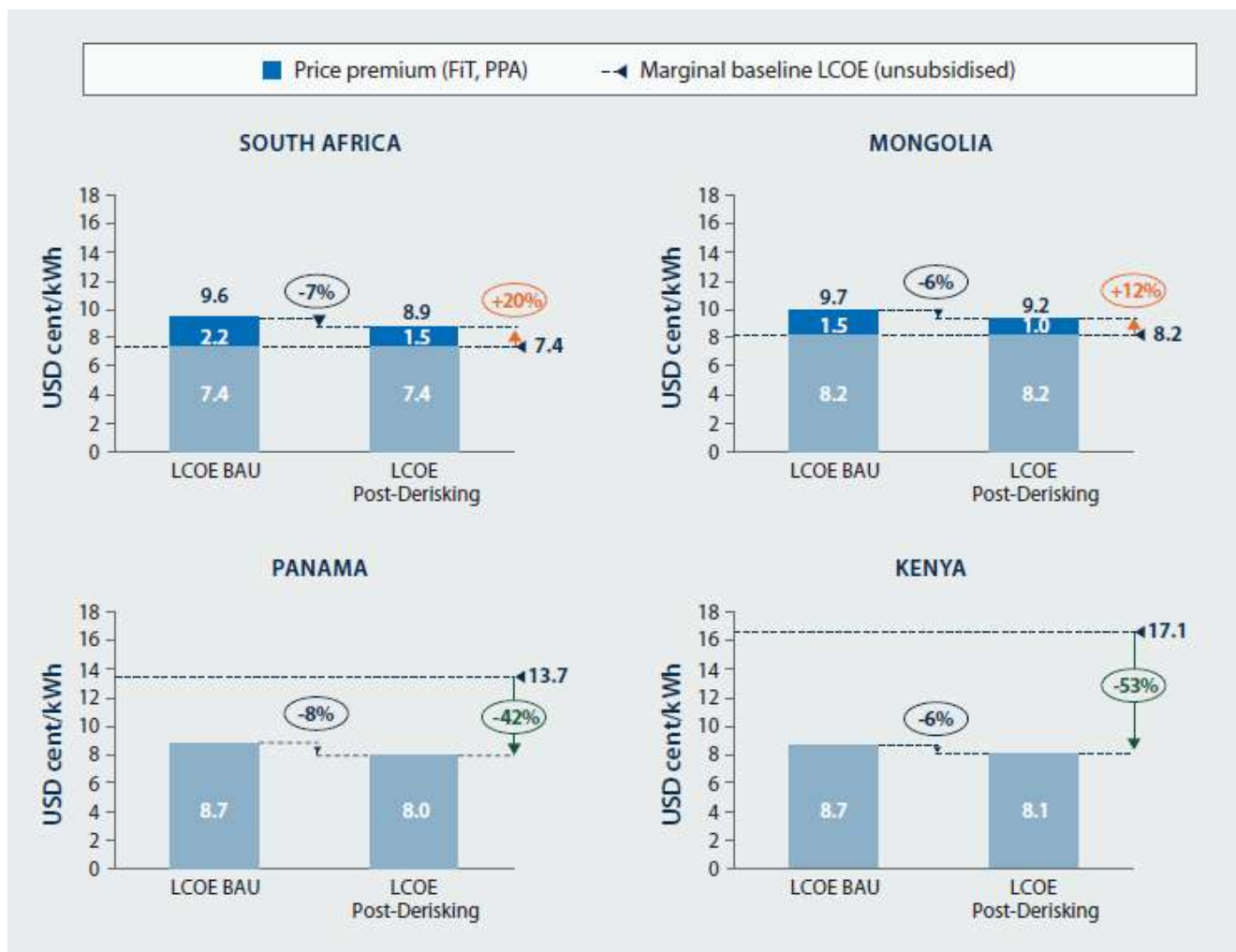
Efectividad del financiamiento público (Metric 1: Ratio de apalancamiento de inversiones)



Efectividad del financiamiento público (Metric 2: Ratio de apalancamiento de ahorros)



Impacto distributivo de la intervención pública (Metric 3: Asequibilidad para el usuario final)



Acciones ampliadas de mitigación del CC (Metric 4: Abatimiento de Carbono)



Conclusión

