

# Derisking Renewable Energy Investments in Developing Countries: A Means to Attract Private Capital and Reduce CO<sub>2</sub> Abatement Costs

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Environmental Energy Technologies  
Division Seminar

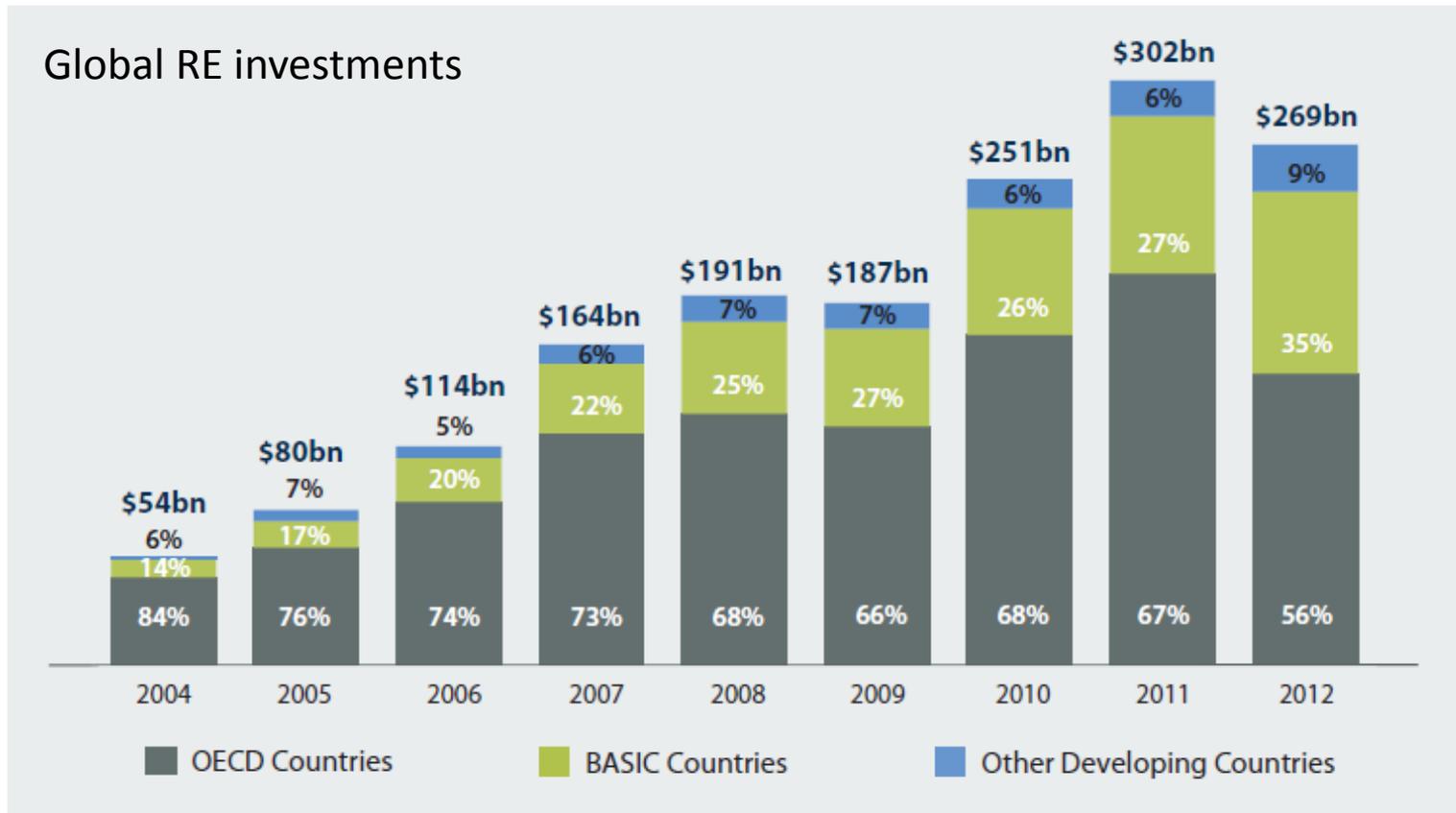
Lawrence Berkeley National Laboratory  
June 25, 2013

# Agenda

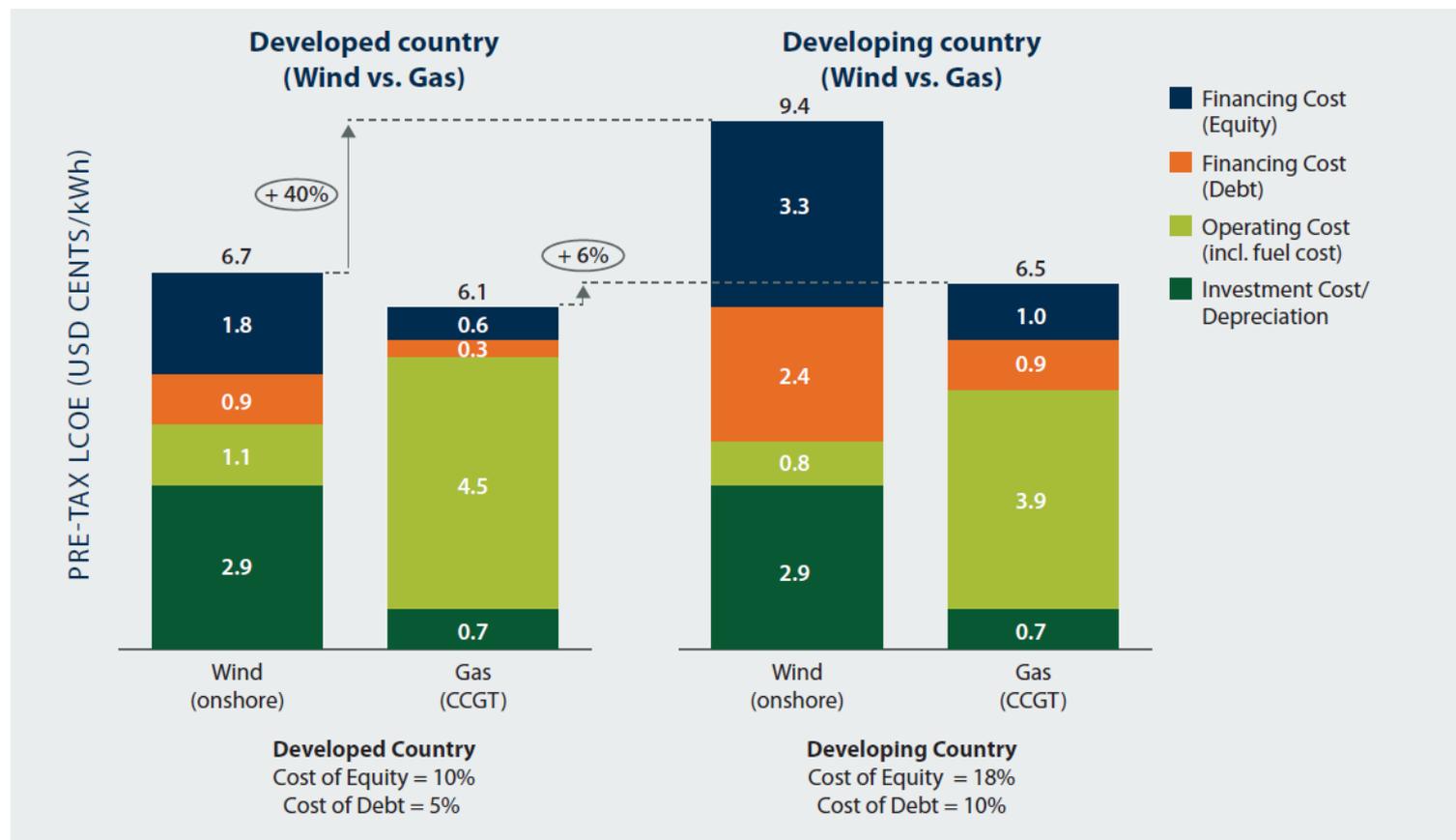
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- 1 The relevance of financing costs for renewables in developing countries
- 2 Investment risks and ways to reduce them: derisking
- 3 Estimating the efficiency of derisking
- 4 Interview and modeling results (finally some numbers!)
- 5 Policy & research implications

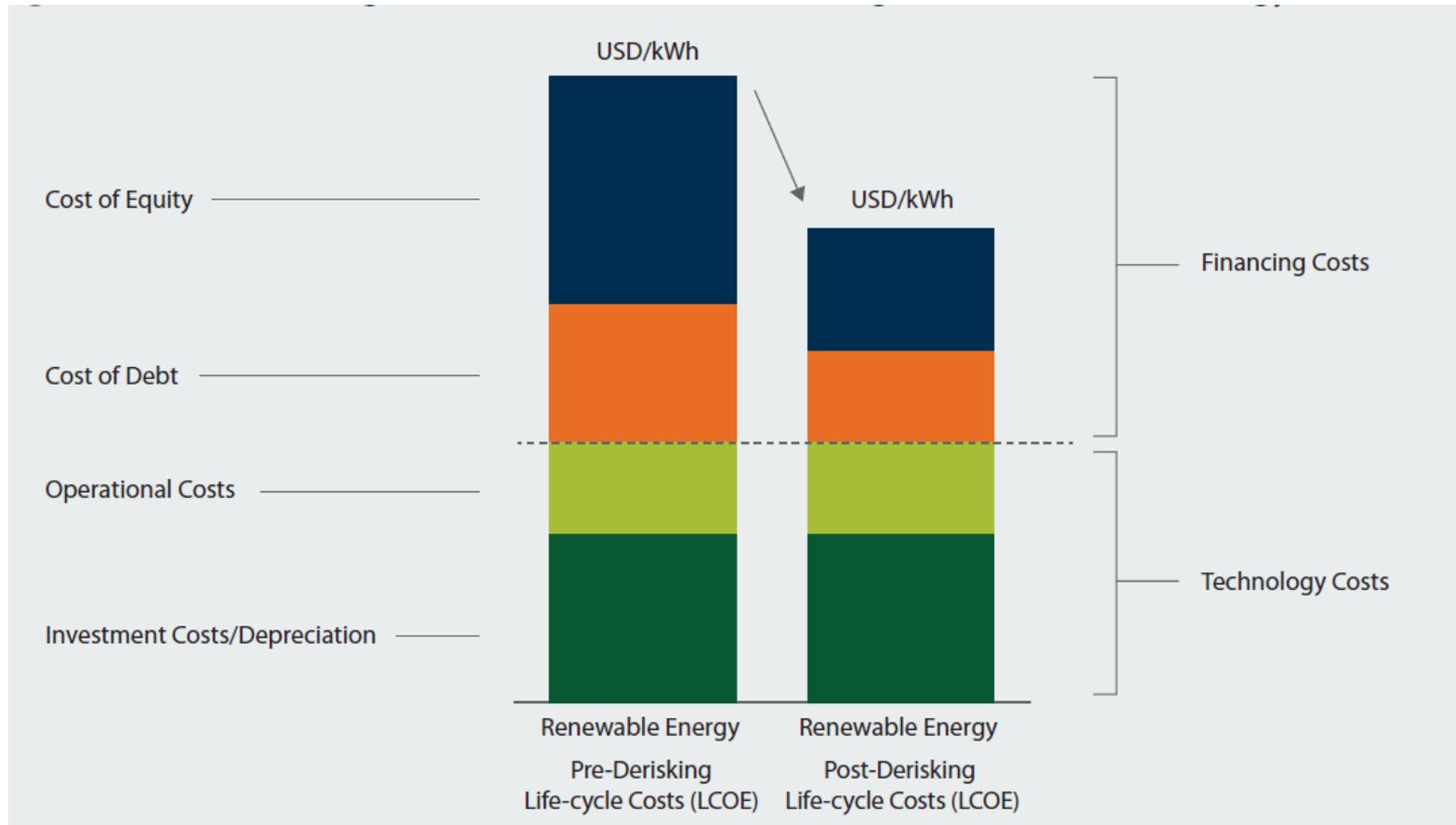
# Global investment in clean energy is rather low in lower-middle and low income countries



# Financing costs heavily affect the competitiveness of renewables



# Reducing financing costs increases the cost competitiveness of renewables and the efficiency of support policies



# Agenda

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1 The relevance of financing costs for renewables in developing countries

2 Investment risks and ways to reduce them: derisking

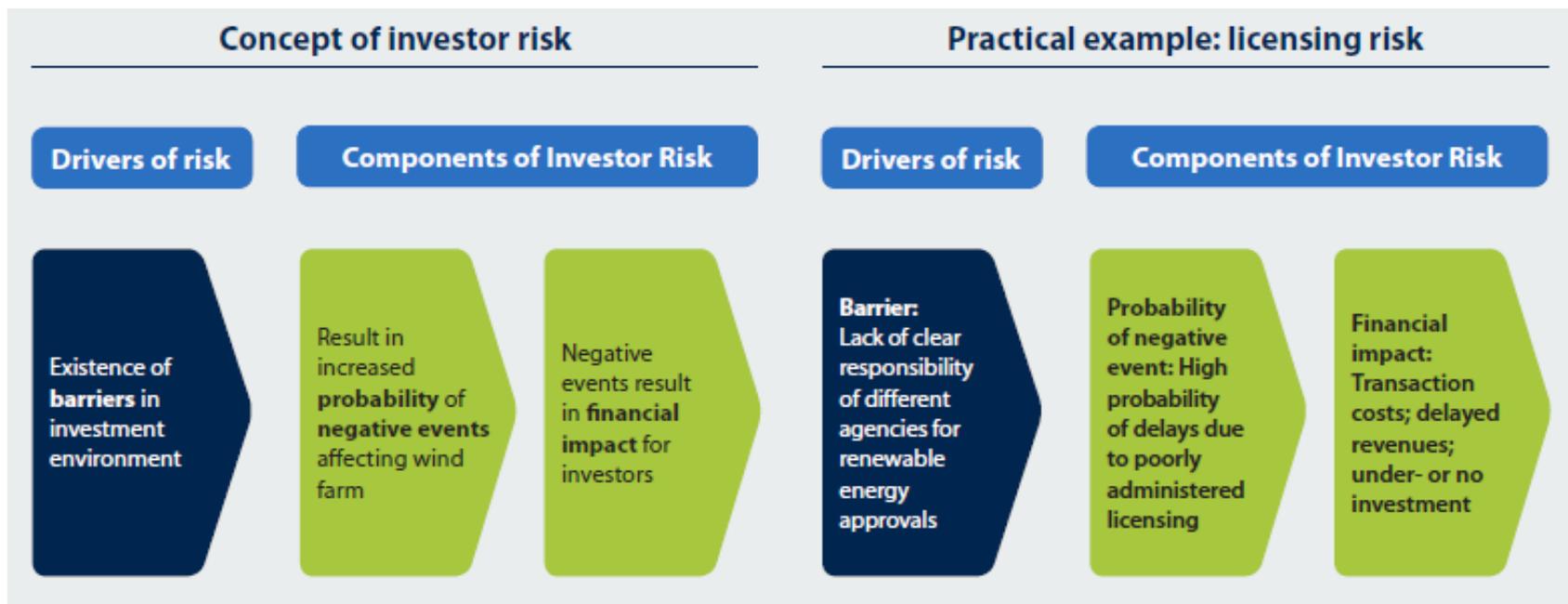
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# Downside investment risk is defined by the combination of the probability of a negative event (driven by barriers in the investment environment) and its potential financial impact

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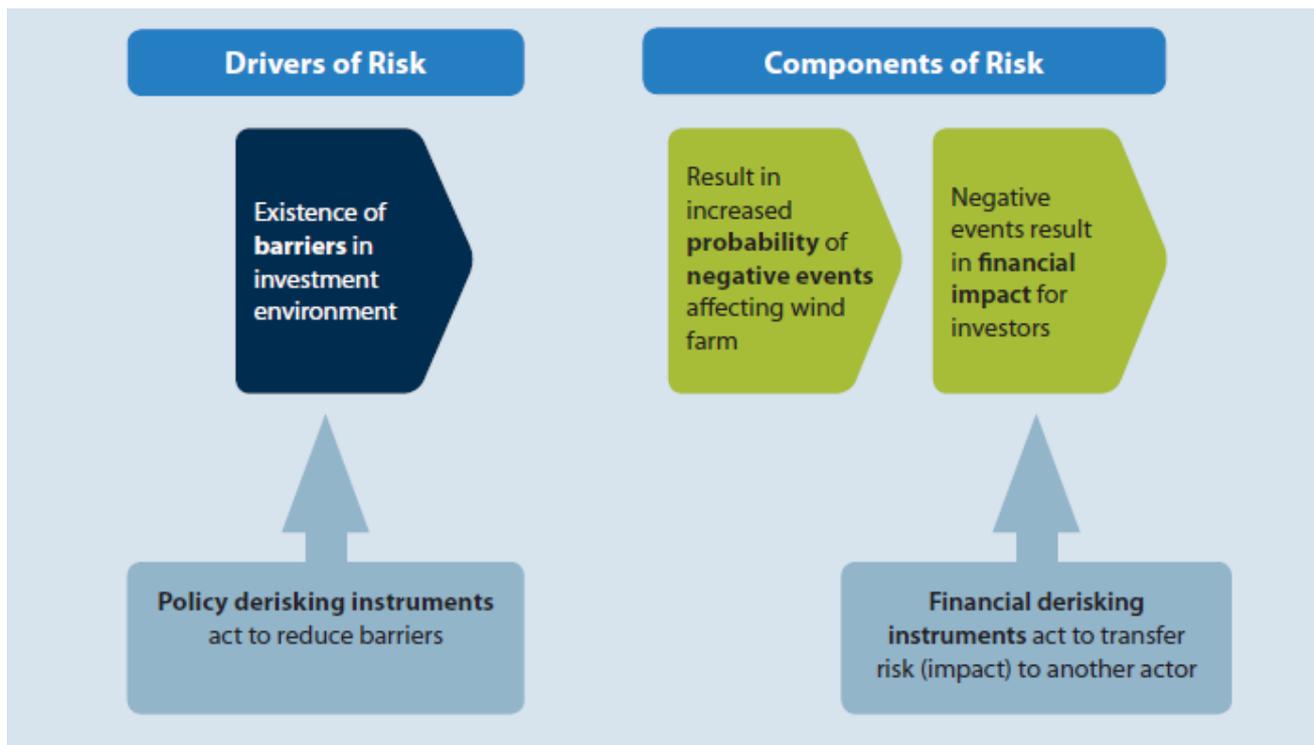
# The higher financing costs in developing countries reflect several higher investment risks typically present in these countries

| BARRIERS                      |  |  |   |
|-------------------------------|--|--|---|
| RISK CATEGORY                 | DESCRIPTION  | UNDERLYING BARRIERS  | KEY STAKEHOLDER GROUP                                 |
| 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"> <li>Market outlook: lack of or uncertainties regarding governmental renewable energy strategy and targets</li> </ul>  | Public sector (policymakers, legislators, regulators) |
|                               |  | <ul style="list-style-type: none"> <li>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</li> </ul>                                   |   |
|                               |  | <ul style="list-style-type: none"> <li>Market distortions: such as high fossil fuel subsidies</li> </ul>   |   |
| 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"> <li>Labour-intensive, complex processes and long time-frames for obtaining licences and permits (generation, EIAs, land title) for renewable energy projects</li> </ul>   | Public sector (administrators)                        |
|                               |  | <ul style="list-style-type: none"> <li>High levels of corruption. No clear recourse mechanisms</li> </ul>  |   |
| 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"> <li>Lack of awareness of wind energy amongst consumers, end-users, and local residents</li> </ul>   | End-users, general public                             |
|                               |  | <ul style="list-style-type: none"> <li>Social and political resistance related to NIMBY concerns, special interest groups</li> </ul>   |   |
| 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"> <li>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</li> </ul>  | Project developers, supply chain                      |
|                               |  | <ul style="list-style-type: none"> <li>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.)</li> </ul> |   |
|                               |  | <ul style="list-style-type: none"> <li>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</li> </ul>                      |   |

| BARRIERS                        |  |  |   |
|---------------------------------|--|--|---|
| RISK CATEGORY                   | DESCRIPTION  | UNDERLYING BARRIERS  | KEY STAKEHOLDER GROUP                         |
| 5. Grid/Transmission Risk       | Risks arising from limitations in grid management and transmission infrastructure in the particular country  | <ul style="list-style-type: none"> <li>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</li> </ul>   | Utility (transmission company, grid operator) |
|                                 |  | <ul style="list-style-type: none"> <li>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</li> </ul>  |   |
| 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"> <li>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</li> </ul>  | Utility (electricity purchaser)               |
| 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"> <li>Capital scarcity: 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</li> </ul>  | Investors (equity and debt)                   |
|                                 |  | <ul style="list-style-type: none"> <li>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</li> </ul> |   |
| 8. Political Risk               | Risks arising from country-specific governance and legal characteristics   | <ul style="list-style-type: none"> <li>Uncertainty or impediments due to war, terrorism, and/or civil disturbance</li> </ul>   | National level                                |
|                                 |  | <ul style="list-style-type: none"> <li>Uncertainty due to high political instability; poor governance; poor rule of law and institutions</li> </ul>  |   |
|                                 |  | <ul style="list-style-type: none"> <li>Uncertainty or impediments due to government policy (currency restrictions, corporate taxes)</li> </ul>   |   |
| 9. Currency/Macro-economic Risk | Risks arising from the broader macro-economic environment and market dynamics  | <ul style="list-style-type: none"> <li>Uncertainty due to volatile local currency; unfavourable currency exchange rate movements</li> </ul>  | National level                                |
|                                 |  | <ul style="list-style-type: none"> <li>Uncertainty around inflation, interest rate outlook due to an unstable macro-economic environment</li> </ul>  |   |

# To reduce the financing costs both aspects of investment risk can be addressed by financial and by policy derisking

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Source: UNDP

# A number of potential instruments for policy and financial derisking exist

## 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"> <li>Market outlook: lack of or uncertainties regarding governmental renewable energy strategy and targets</li> </ul>  | 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"> <li>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</li> </ul>                                   |   | 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"> <li>Market distortions: such as high fossil fuel subsidies</li> </ul>   |   | 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"> <li>Labour-intensive, complex processes and long time-frames for obtaining licences and permits (generation, EIAs, land title) for renewable energy projects</li> </ul>   | 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"> <li>High levels of corruption. No clear recourse mechanisms</li> </ul>  |   | 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"> <li>Lack of awareness of wind energy amongst consumers, end-users, and local residents</li> </ul>   | 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"> <li>Social and political resistance related to NIMBY concerns, special interest groups</li> </ul>   |   | 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"> <li>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</li> </ul>  | 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"> <li>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.)</li> </ul> |   | 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"> <li>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</li> </ul>                      |   | 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 |

# A number of potential instruments for policy and financial derisking exist

## Public instrument table for renewable energy (Part 2)

| BARRIERS                        |  |   |   | MENU OF SELECTED PUBLIC INSTRUMENTS  |   |   |  |
|---------------------------------|--|---|---|--|---|---|--|
| RISK CATEGORY                   | DESCRIPTION  | 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"> <li><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</li> </ul>   | 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"> <li><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</li> </ul>  |   | 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"> <li>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</li> </ul>   | 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"> <li><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</li> </ul>  | 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"> <li><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</li> </ul> |   | 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"> <li>Uncertainty or impediments due to war, terrorism, and/or civil disturbance</li> </ul>  | 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"> <li>Uncertainty due to high political instability; poor governance; poor rule of law and institutions</li> </ul>   |   |  |   |   |  |
|                                 |  | <ul style="list-style-type: none"> <li>Uncertainty or impediments due to government policy (currency restrictions, corporate taxes)</li> </ul>  |   |  |   |   |  |
| 9. Currency/Macro-economic Risk | Risks arising from the broader macro-economic environment and market dynamics  | <ul style="list-style-type: none"> <li>Uncertainty due to volatile local currency; unfavourable currency exchange rate movements</li> <li>Uncertainty around inflation, interest rate outlook due to an unstable macro-economic environment</li> </ul>  | 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> |   |   |  |

## Thus far, derisking has not been analyzed quantitatively

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- How effective and efficient are these derisking instruments?
- How can policy makers combine them with other renewable support policies to increase the effectiveness and efficiency of the overall policy mix?

# Agenda

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2 Investment risks and ways to reduce them: derisking

3 Estimating the efficiency of derisking

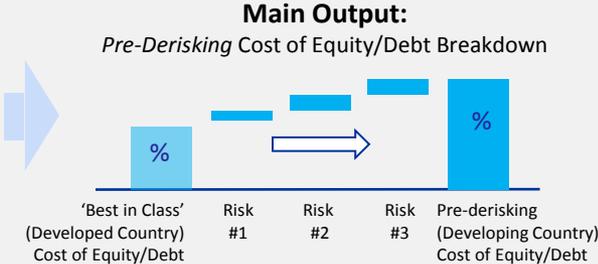
4 Interview and modeling results

5 Policy & research implications

# The UNDP Report proposes 4 stages to quantify the derisking potential (Risks, Instruments, Cost, Evaluation)

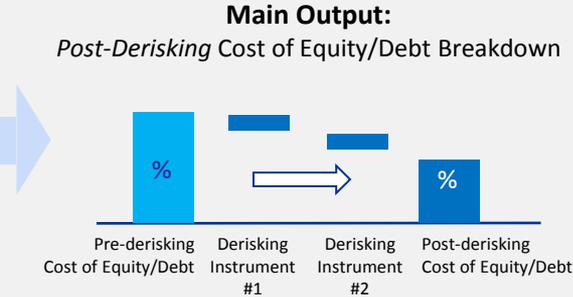
## 1) Risk Environment Stage

Understand the risks in the investment environment and quantify their impact on financing costs



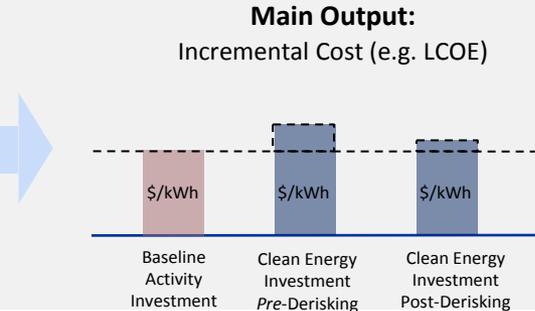
## 2) Public Instrument Stage

Select de-risking instruments that suit the investment environment and quantify their impact on financing costs



## 3) Levelized Cost Stage

Calculate the incremental costs and the impact of the de-risking instruments on these



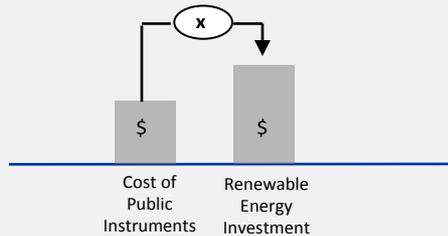
## 4) Evaluation Stage

# The UNDP proposes four metrics to evaluate the effects of derisking instruments (evaluation stage)

4) Evaluation Stage

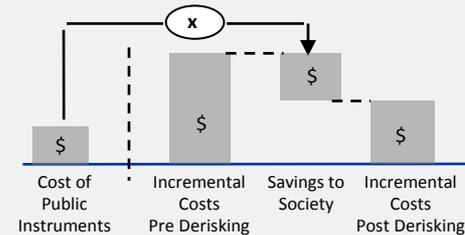
## Output Metric 1: *Investment Leverage Ratio*

Across a sector, compares the total USD cost of all public instruments deployed versus the resulting USD private sector investment.



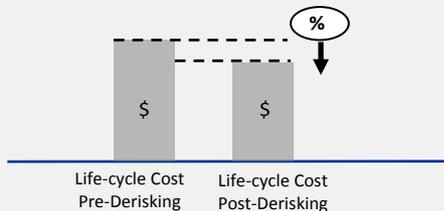
## Output Metric 2: *Savings Leverage Ratio*

Across a sector, compares the USD cost of derisking instruments deployed versus the resulting USD economic savings.



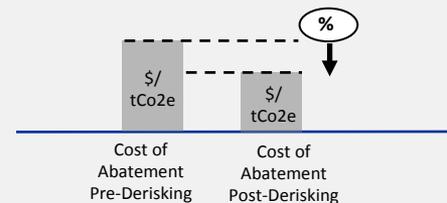
## Output Metric 3: *End-user Affordability*

Compares the life-cycle costs of the clean energy for the post derisking scenario versus the pre-derisking scenario.



## Output Metric 4: *Carbon Abatement*

Across a sector, assesses the incremental costs of clean investment over the baseline activities in terms of carbon abatement,

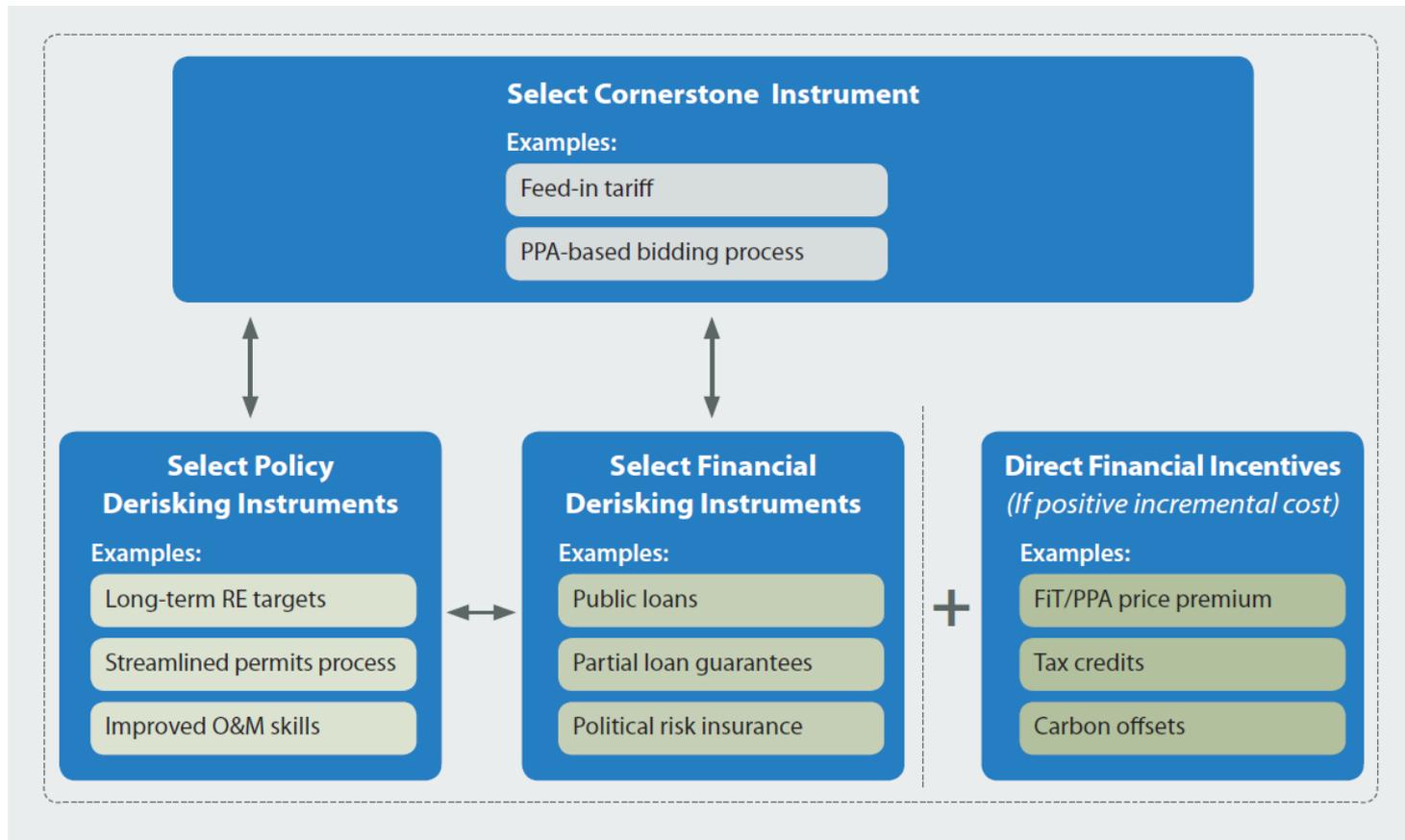


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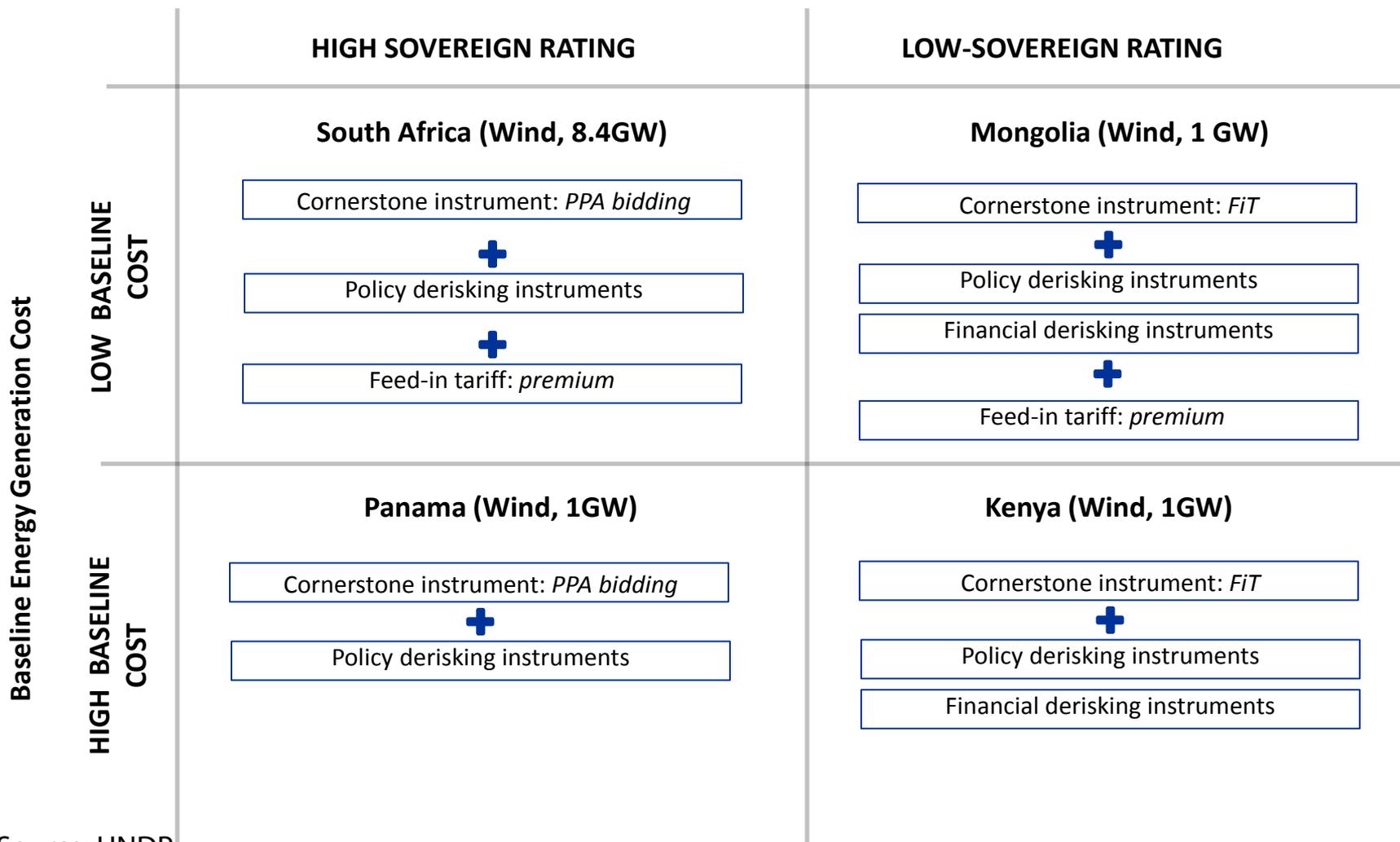
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# The policy mix for renewable energy deployment should reflect each country's situation



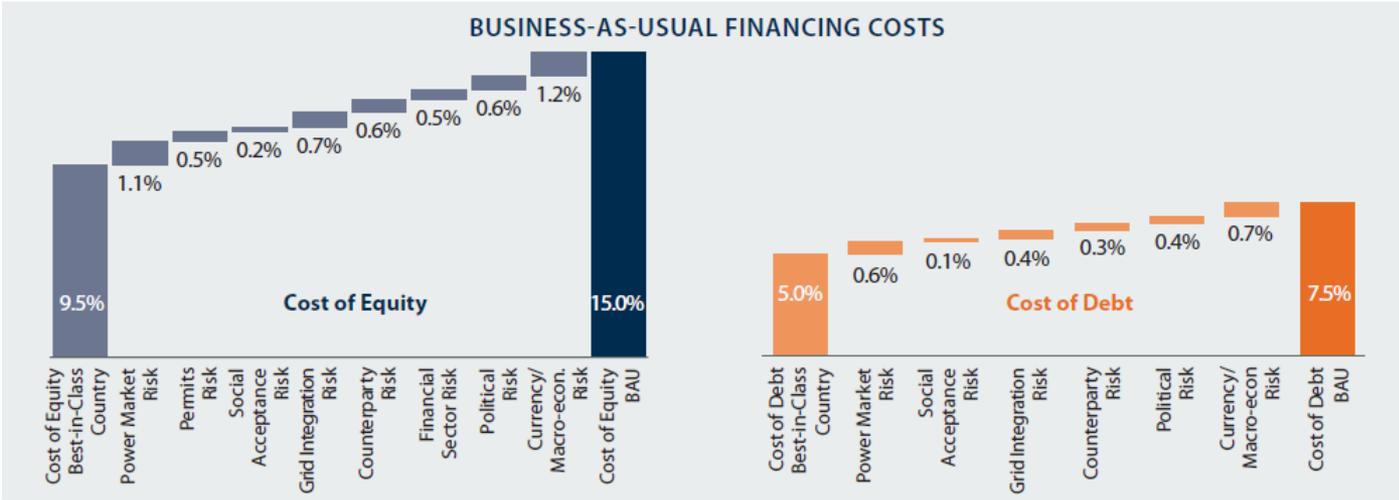
# The UNDP Report proposes 4 stages to quantify the derisking potential (Risks, Instruments, Cost, Evaluation)

## General Investment Environment

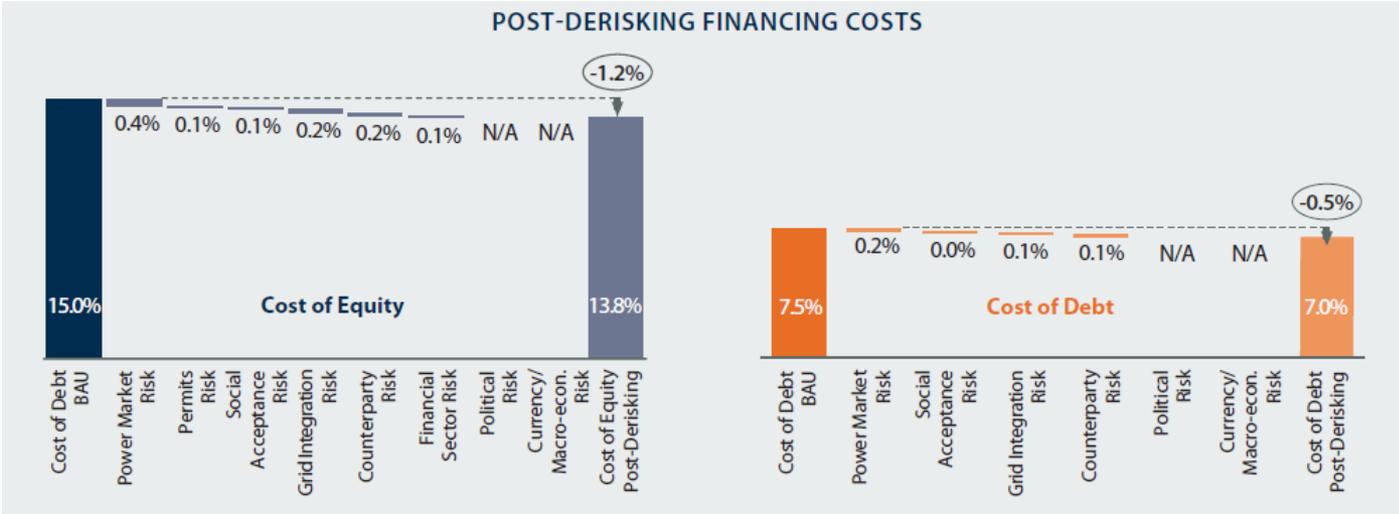


# South Africa’s “upward financing cost waterfall” shows the relative importance of risks and the “downward waterfall” the potential derisking effects

## 1) Risk Environment Stage



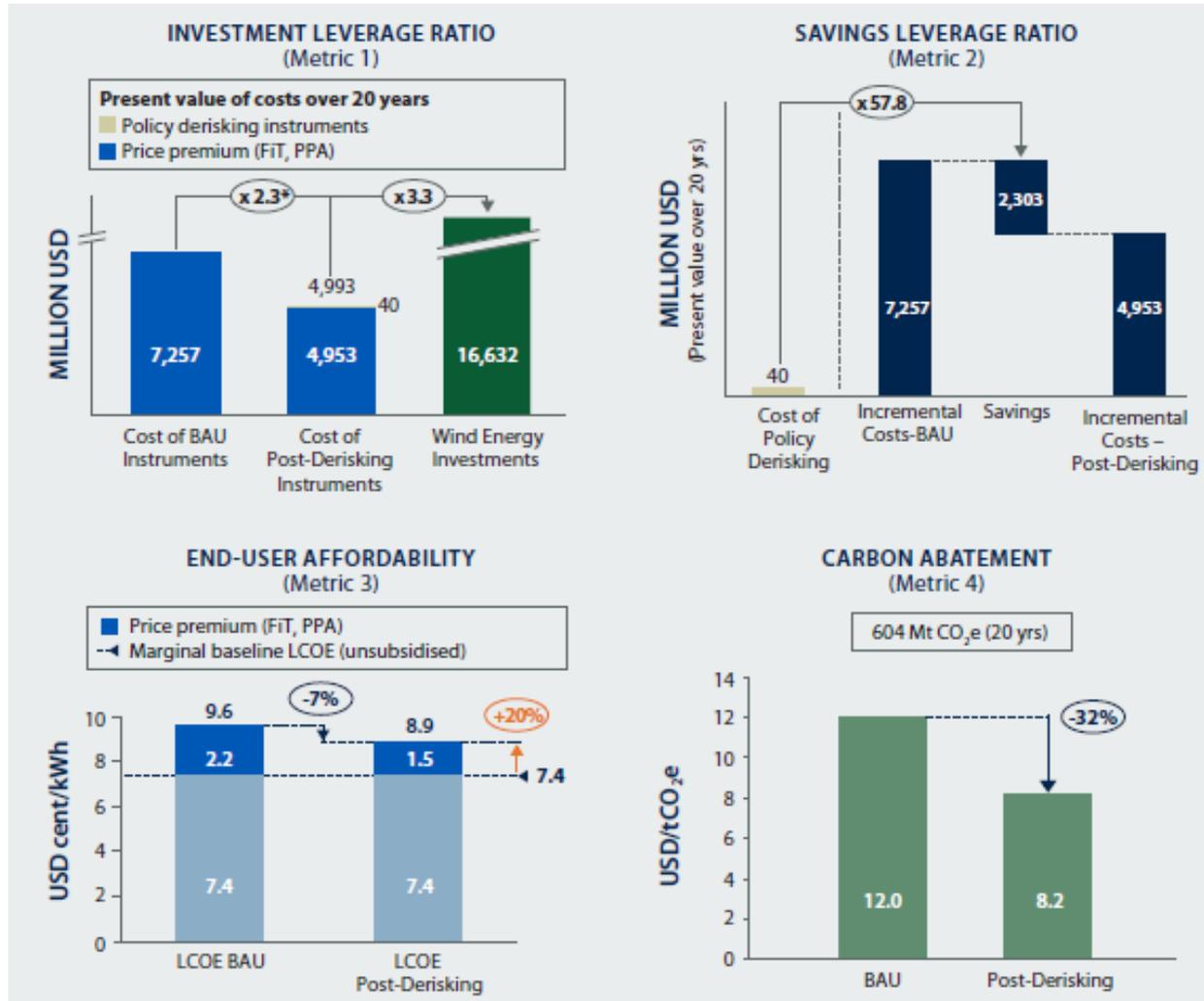
## 2) Public Instrument Stage



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.

# In South Africa, derisking has high potential to increase the efficiency of the enacted support policy for Wind (tendering)

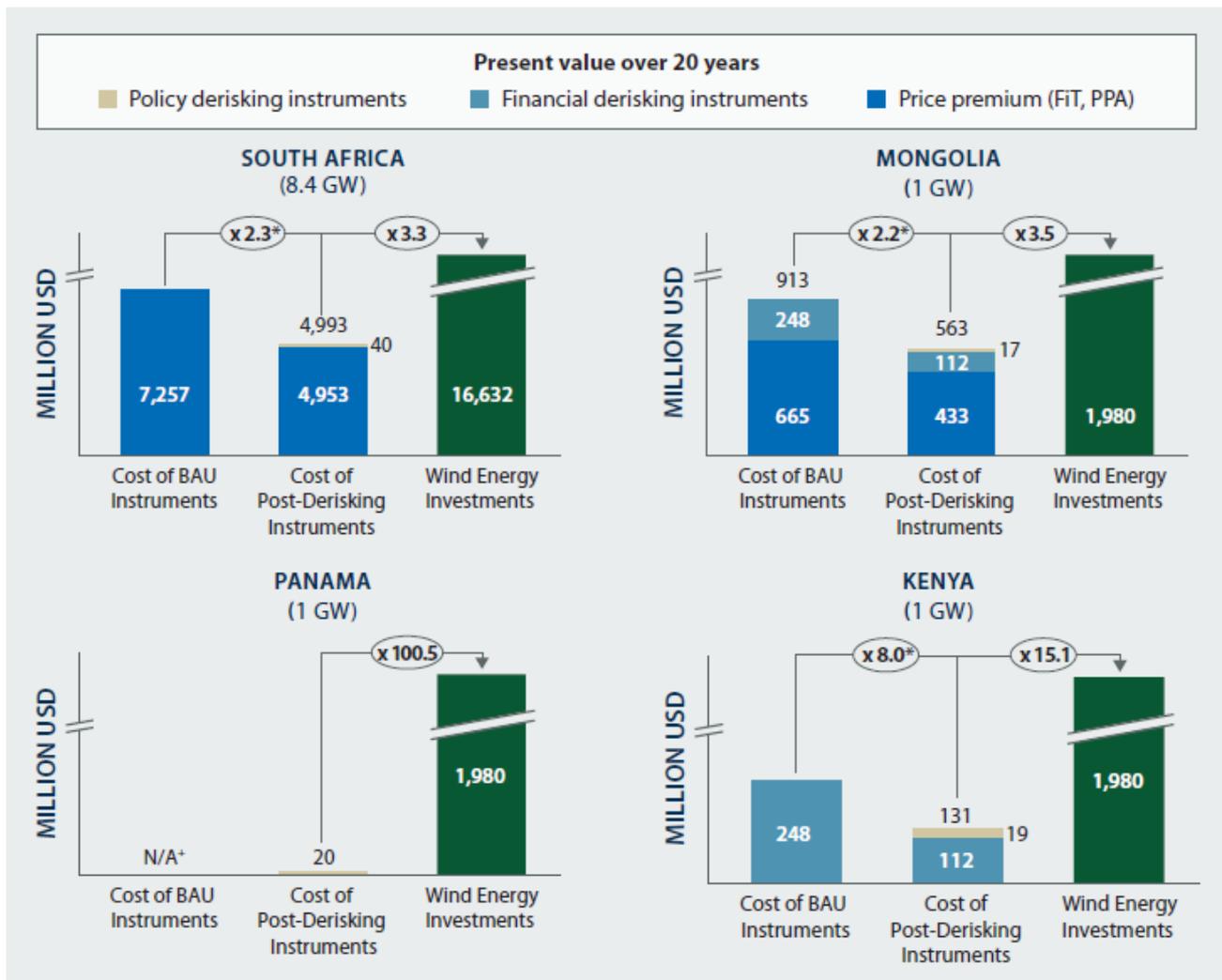
## 4) Evaluation stage



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.

# Our results suggest that the efficiency and effectiveness of renewable support policies can be strongly increased through derisking in all 4 countries analyzed

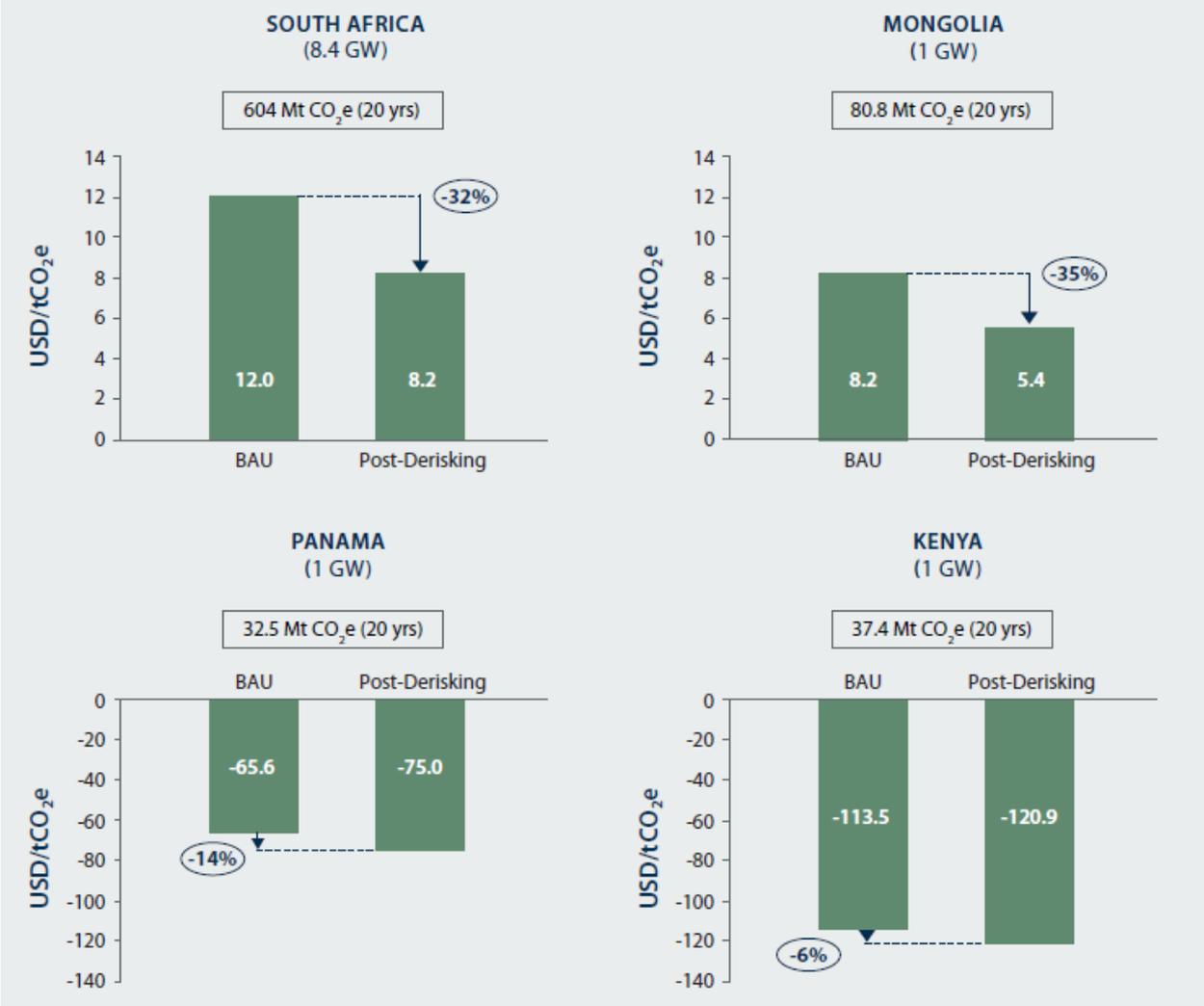
## 4) Evaluation stage



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.

# Our results suggest that derisking can bring down the abatement costs substantially in all 4 countries analyzed

## 4) Evaluation stage



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.

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# **While this report is just a first step, the results are promising and provide policy recommendations; however, more detailed modeling and additional research needed**

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## **Implications for policy:**

- ⇒ The effectiveness and efficiency of renewable energy support policies can be significantly decreased if they contain complementary de-risking instruments
- ⇒ However, the selection of de-risking instruments needs to be tailored to each country
- ⇒ Derisking should be considered in the international climate policy debate (especially in post-Kyoto mechanisms)
- ⇒ The UNDP framework is one starting point to systematically think about derisking and can assist policy makers in the tailoring process

## **Implications for research:**

- ⇒ More research needed to increase the knowledge base on risks and financing costs in developing countries
- ⇒ Improve understanding of derisking effects

# Thank you for your attention!



The full report, an executive summary, and a simplified excel model can be downloaded here:

[http://www.undp.org/content/undp/en/home/librarypage/environment-energy/low\\_emission\\_climate\\_resilient\\_development/derisking-renewable-energy-investment/](http://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climate_resilient_development/derisking-renewable-energy-investment/)

Further work on the role of policy in inducing technological change in the electricity sector can be found at:

[www.sustec.ethz.ch/docs/index](http://www.sustec.ethz.ch/docs/index)