Cost of Capital for Renewable Energy Investments in Developing Economies

And the need for a Global Credit Guarantee Facility

Discussion Paper

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CLIMATE POLICY INITIATIVE

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ABOUT CLIMATE POLICY INITIATIVE

CPI is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has six offices around the world in Brazil, India, Indonesia, the United Kingdom, and the United States.

1. CONTEXT

Many countries are setting ambitious net zero targets and are embracing renewable energy expansion as a principal part of that strategy. Investments to tackle this renewable energy transition, however, are still largely concentrated in high-income countries, despite the higher potential for many lower-income countries.

In conjunction with the International Solar Alliance (ISA), CPI conducted a market readiness analysis of more than 40 ISA member countries with high solar output and significant associated investment potential. The goal was to better understand the investment risk specific to solar energy development and the impact of those risks on the commercial viability of such projects. The conclusions of this analysis are relevant for all renewable energy investments in developing economies.

SOLAR POTENTIAL VS. INSTALLED CAPACITY

Solar investment potential was assessed on three parameters:

1. **Solar Potential**: the amount of solar energy received by the country (land area x solar radiation); also referred to as Global Horizontal Irradiation (GHI).
2. **Transition Readiness**: a benchmark established by World Economic Forum, based on retail tariff, share of fossil fuels, solar policy, and regulation.
3. **Ease of Doing Business**: an index developed by ISA in conjunction with EY

When we mapped solar potential and solar installed capacity we found that, overwhelmingly, countries with higher GDP per capita had higher solar installed capacities per unit land area—even if the country had relatively low solar radiation potential—but lower-income countries had lower solar installed capacity per unit land area, even though they had significantly higher radiation potential.

Table 1: Representative mapping of solar radiation potential and solar installed capacity

Country	Radiation Potential (TWh)	Installed Capacity/Area (kW/km2)
Brazil	15.394	0.94
China	15.243	27.42
India	5.670	13.00
Algeria	5.215	0.21
Argentina	4.865	0.37
Saudi Arabia	4.721	0.19
Congo	4.122	0.00
South Africa	2.608	5.00
Peru	2.301	0.23
Kenya	1.292	0.17
Thailand	0.920	6.00
Vietnam	0.545	56.67
Japan	0.496	167.50
Germany	0.375	154.29
South Korea	0.147	150.00
Netherlands	0.031	333.33

A table with the above data for all countries included in this analysis is available in Annex V.

SUMMARY OF OUR SOLAR POTENTIAL VS. INSTALLED CAPACITY PER UNIT LAND AREA ANALYSIS

Northern European countries—along with Japan and South Korea—have low-to-average GHI but have some of the highest installed solar capacity per unit land area, due to high GDP along with stable political environments and favorable policy support to solar.

Sub-Saharan African countries have abundant solar potential (high GHI) but are economically constrained (low nominal GDP per capita) and have not been able to support the growth of solar, regardless of the policy environment.

Middle East and North African (MENA) countries are predominantly middle-income countries with ample solar potential (high GHI), but inconsistent political environments have presumably led to modest solar installations.

China, Vietnam, and India are exceptions. Despite being low-to-middle income economies, they have sizable solar installations per unit land area through directed policy and institutional initiatives aligned with their NDC commitments.

The second part of this paper gives a brief overview of our methodology, including an analysis of the required rate of equity return or debt for solar projects, by country, under current cost-of-capital environments.

The third part of this paper proposes a credit guarantee facility that could help address these cost-of-capital issues, allowing countries with high solar potential to reduce some of these barriers and significantly increase their installed capacity.

2. METHODOLOGY

To study the relationship between risk and return for solar projects, we created a **Climate Investment Risk Score (CIRS)**, which is a weighted average risk score for sovereign credit risk, political risk, and off-taker credit risk[1]. Our analysis is based on the Capital Asset Pricing Model (CAPM) for cost of debt and equity.

As a next step, we calculated the required rate of return expected by capital from a climate project. We used the capital asset pricing model and adjusted it for expected climate investment risk in the country. (Detailed methodology in Annex I).

Though our research was focused on solar energy, this approach could guide risk premium for many other renewable energy investments.

The results indicate that evaluation of climate projects escalates return requirements. Expected returns and interest rates for debt are given in Table 2, which plots the expected required rates of return for climate projects against the climate investment risk for a sub-set of the shortlisted countries. (Calculation for all shortlisted countries is in Annex II).

[1] Climate Investment Risk Score (CIRS) used S&P Sovereign Credit Ratings, Political Risk Scores from PRS, and the Offtake Credit Risk of the largest utility in the respective countries.

Table 2. Cost of capital across various countries*

Country	S&P Rating	Climate Investment Risk Premium (CIRP)	Cost of Debt (Climate Project)	Required Rate of Equity Return (Climate Project)
Germany	AAA	1%	2.8%	8.3%
Australia	AAA	3%	5.4%	8.5%
Sweden	AAA	2%	3.4%	9.3%
USA	AA+	2%	5.3%	10.3%
UAE	AA	2%	4.5%	12.6%
Saudi Arabia	A-	6%	9.3%	14.3%
Chile	A	10%	12.1%	14.4%
Indonesia	BBB	9%	9.1%	14.7%
Morocco	BBB-	10%	12.8%	15.9%
India	BBB-	9%	11.4%	17.2%
Vietnam	BB	12%	14.0%	19.4%
Peru	BBB	8%	11.7%	21.3%
Brazil	BB-	14%	7.8%	22.2%
South Africa	BB-	15%	20.3%	25.8%
Ghana	B-	19%	22.7%	28.3%
Tanzania	B	18%	24.1%	29.6%
Nigeria	B+	17%	25.2%	30.8%
Egypt	B	18%	29.5%	35.1%
Uganda	B+	17%	30.2%	35.8%
Mozambique	CCC+	22%	32.8%	38.3%
Tunisia	CCC+	23%	36.5%	42.1%
Sri Lanka	D	16%	38.1%	43.7%
Zambia	CCC-	29%	45.4%	51.0%
Argentina	CCC+	24%	54.1%	59.7%

*Based on data as of January 2023

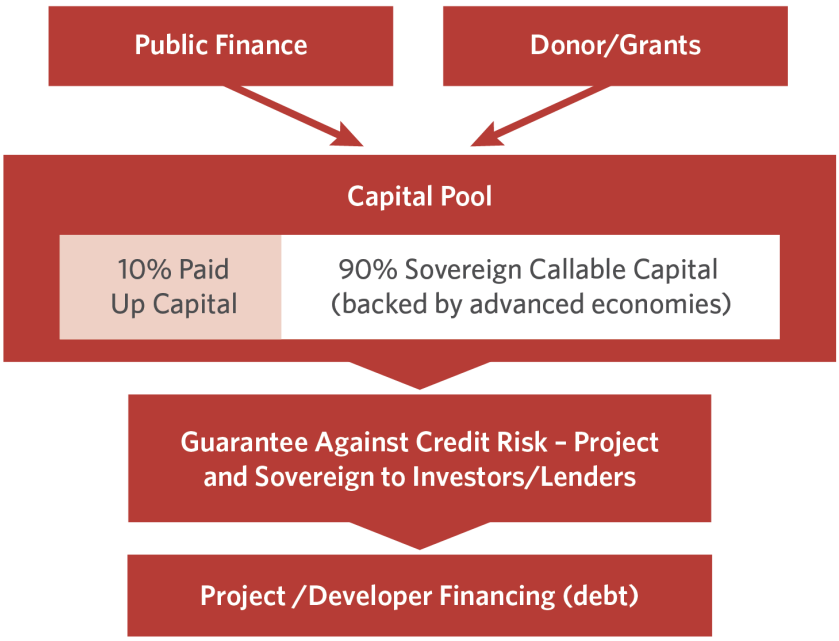
To increase investments in solar energy in countries with high solar potential, it is imperative to de-risk cross-border capital flows. One possible way to do this is through a global credit guarantee facility, which would provide overall credit risk mitigation to cross-border debt financing through bonds or loans. The proposed facility only addresses sovereign and off-taker credit risk; it does not address project-level risks within the country that could be sectoral and/or project-specific.

3. PROPOSED GLOBAL CREDIT GUARANTEE FACILITY (GCGF)

In 2017, the International Solar Alliance (ISA) commissioned a feasibility study to explore an easily accessible, first-loss financial guarantee instrument. From this study, the Common Risk Mitigation Mechanism (CRMM) idea was developed.[2] The CRMM included a bundle of different risk management instruments ranging from guarantees to insurance to swaps, covering risks in both local and hard currencies. CRMM proposed a pilot guarantee facility with USD 1 billion capitalization to enable an asset portfolio of USD 15 billion in solar investments. Though CRMM did not happen, this approach was widely discussed and debated.

Building on the CRMM experience, we propose a new **Global Credit Guarantee Facility (GCGF)** focused on de-risking and reducing the cost of global capital financing from OECD countries to Emerging Market & Development Economy (EMDE) countries. GCGF would primarily focus on aggregate credit risk for lenders. Political and foreign exchange risks would be transferred to appropriate existing institutions such as MIGA and TCX.

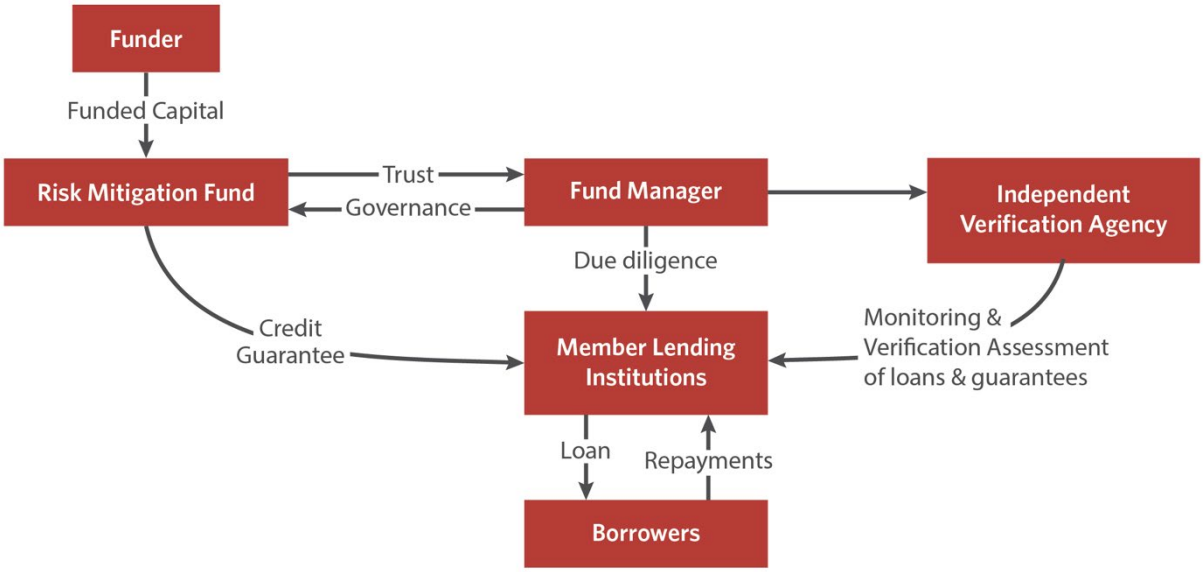
Figure 1. Proposed GCGF structure



[2] https://www.ceew.in/publications/common-risk-mitigation-mechanism

The GCGF could either be fully or partially funded, depending on backstop support, with callable capital from OECD countries.

Figure 2. Representative GCGF institutional mechanism



The proposed structure is a trust fund, incorporated in suitable legal jurisdiction, managed by a facility/fund manager. The GCGF would work as a bilateral loss-sharing agreement between the credit guarantee trust and member institutional investors/international financial institutions.

Credit risk—sovereign and off-taker—would be managed by providing a partial guarantee. In case of delay/default in debt servicing, GCGF would reimburse a portion of any losses incurred by borrowers.

3.1 SIZING THE GCGF

To execute the solar targets announced by governments of the shortlisted countries (derived from government solar plans), a total of ~USD 175 billion of capital will be needed, of which 70% (USD 120 billion) would be debt. With an empirically derived average default rate of 11%, and a guarantee coverage of 50%, a USD 6.6 billion guarantee facility is proposed, capitalized at 10% with the balance as callable capital. Capital would get called only when losses exceed capitalization of the facility. This results in a (direct) leverage of 250x for the total capital mobilized. Details on facility sizing are provided in Annex III.

3.2 IMPACT OF CREDIT GUARANTEE ON RISK PREMIA

3.2.1 APPROACH 1: OVERALL RISK REDUCTION

With the assumption that the guarantor would be a supranational institution with a AAA rating, we recalibrated the sovereign credit risk and off-taker risk scores, keeping the political risk score the same. With this we arrived at an enhanced climate investment risk score, which was then used in the regression to recalculate the climate investment risk premiums.

For the sample set of countries, the average reduction in risk premium is 6% and the average improvement in rating is 5-6 notches[3].

[3] Notches are the credit rating agency tiers for specific instruments or entities, for example, improving one notch from "BB" to "BB+".

Table 3. Effective Reduction in Cost of Finance through GCGF

Country	Current S&P Rating	Enhanced S&P Rating	Rating Notches Improved	Reduction in Climate Investment Risk Premium
Zambia	CCC-	BBB-	9	18%
Argentina	CCC+	BBB	8	14%
Tunisia	CCC+	BBB	8	13%
Mozambique	CCC+	BBB	8	12%
Ghana	B-	BBB+	8	11%
Tanzania	B	BBB+	7	10%
Egypt	B	BBB+	7	10%
Nigeria	B+	BBB+	6	9%
Uganda	B+	BBB+	6	9%
Costa Rica	B	BBB+	7	9%
South Africa	BB-	A-	6	8%
Brazil	BB-	A-	6	7%
Bangladesh	BB-	A-	6	7%
Vietnam	BB	A-	5	6%
Morocco	BBB-	A+	5	5%
India	BBB-	A+	5	4%
Indonesia	BBB	A+	4	4%
Peru	BBB	A+	4	3%
Saudi Arabia	A-	AA-	3	2%
Chile	A	AA-	2	2%
Average (above mentioned countries)			**5.6**	**6%**

As evident from the table above, riskier countries benefit more. A full table of this analysis for all shortlisted countries is available in Annex IV-1.

3.2.2 APPROACH 2: ONLY LOWERING THE DEFAULT RATE

Rating agencies may hold a more conservative view and consider the guarantee to lower only the expected default rate and not the overall risk. With the guarantor being AAA-rated (same as above), the 10-year expected default rates for the sample countries were recalculated and their new and lowered default rates were matched to the corresponding rating, using Moody's cumulative default rate tables.

With these new ratings, the sovereign credit risk and off-taker risk scores were recalibrated, keeping the political risk score the same. The new and enhanced scores were then used in the regression to recalculate the climate investment risk premia.

For the sample set of countries, the average reduction in risk premium is 3% and the average improvement in rating is 2-3 notches. As with Approach 1, riskier countries benefit more. Approach 2 analysis for all shortlisted countries is available in Annex IV-2.

4. CONCLUSIONS AND WAY FORWARD

We adopted a purely theoretical approach to evaluating the cost of capital for climate projects in the shortlisted EMDE countries. This should be validated with empirical analysis of the observed cost of capital for climate projects in these countries.

Our analysis combines credit default risk and foreign exchange risk into a single risk premium (and factors in political risks to the extent they get factored into sovereign credit risk). Follow-on research to separate these risks would help better facilitate transferring and pricing the foreign exchange risk to TCX or a similar entity. Core political risks could be handled by MIGA. This would effectively allow the proposed risk mitigation facility to focus purely on alleviating the credit default risk for cross-border climate finance.

The success of our proposal hinges on donor countries committing callable capital to the risk mitigation facility. Further research to identify and determine which countries could provide this form of capital, and in what proportion, would be valuable in identifying the most suitable agency, or a new institution that could sponsor the facility with funded capital, as well as oversee its management and implementation.

In order to estimate the total debt that would be guaranteed by the proposed risk mitigation facility, we have considered the 2030 solar installation targets set by the governments of each of the shortlisted countries. Further analysis to identify the near-term executable pipeline of projects in each of these countries would be advantageous to estimate an appropriate size more accurately for the proposed risk mitigation facility.

As this is a discussion paper, CPI welcomes feedback. Please contact authors Kushagra Gautam (kushagra.guatam@cpiglobal.org), Dhruba Purkayastha (dhruba.purkayastha@cpiglobal.org), or Vikram Widge (vikram.widge@cpiglobal.org).

5. ANNEX I: COST OF CAPITAL METHODOLGY

For each of the 47 shortlisted countries, we calculated the Weighted Average Cost of Capital (WACC), by considering the national government bond yield, equity index returns, and the Climate Investment Risk Score (CIRS). CIRS incorporates national government credit risk (SR), off-taker risk (OR), and political risk (PR).

Subsequently, we did a regression between the WACC and CIRS for these 47 countries and found the natural logarithmic curve to best explain the relationship. Using this empirically derived relationship, we recalibrated the cost of capital for each country and classified this as the implied Climate Investment Risk Premium (CIRP), to reflect the incremental risk premium for climate investments in the country. While the initial WACCs were independently observed datasets, the recalibrated CIRP measures the expected relative opportunity cost of investing in these countries under a pre-defined set of risks.

FOR ANY COUNTRY "i":

- **Re(i)** = Rf + β x (Re,m(i) – Rf) + CIRP(i)
- **Rd(i)** = Rf + β x (Rd,m(i) – Rf) + CIRP(i)
- **CIRP(i)** = -K x Ln(CIRS(i)) + λ
- **CIRS(i)** = 0.5 x SR(i) + 0.2 x PR(i) + 0.3 x OR(i)
- **CIRP(i)** is derived from a regression between WACC(i) and CIRS(i), where
- **WACC(i)** = 0.7 x Rd,m(i) + 0.3 x Re,m(i)

GLOSSARY

- $R_{e(i)}$ = Required Rate of Equity Return for a Climate Project in Country "i"
- $R_{d(i)}$ = Required Cost of Debt for a Climate Project in Country "i"
- R_f = Risk Free Rate for a Global Institutional Investor (taken as 10-yr US Treasury rate)
- β = Emerging Market Beta for Renewable Energy (taken from Damodaran)
- $R_{e,m(i)}$ = Market Equity Returns for Country "i" (taken as long-term benchmark stock index returns adjusted for US$ currency depreciation)
- $R_{d,m(i)}$ = Market Bond Returns for Country "i"(taken as local government 10-yr bond yields adjusted for US$ currency depreciation)
- $CIRP_{(i)}$ = Climate Investment Risk Premium for Country "i"
- K, λ = Regression constants
- $CIRS_{(i)}$ = Climate Investment Risk Score for Country "i"
    - **SR** = Sovereign Credit Risk for Country "i" (S&P credit rating standardized on a scale of 100)
    - **PR** = Political Risk for Country "i" (PRS Group rating standardized on a scale of 100)
    - **OR** = Off-taker Risk for Country "i" (S&P/Moody's/Fitch Rating for the largest power utility for Country "i")
- $WACC_{(i)}$ = Weighted Average Cost of Capital for a government-sponsored climate project in Country "i"

6. ANNEX II: COST OF CAPITAL FOR ALL SHORTLISTED COUNTRIES

Country	S&P Rating	Climate Investment Risk Premium (CIRP)	Cost of Debt (Climate Project)	Required Rate of Equity Return (Climate Project)
Germany	AAA	1%	2.8%	8.3%
Australia	AAA	3%	5.1%	8.5%
Sweden	AAA	2%	3.4%	9.3%
Netherlands	AAA	2%	4.8%	9.4%
Norway	AAA	1%	3.3%	9.6%
France	AA	5%	6.3%	9.6%
USA	AA+	2%	5.3%	10.3%
Israel	A+	4%	6.0%	10.5%
UAE	AA	2%	4.5%	12.6%
Saudi Arabia	A-	6%	9.3%	14.3%
Chile	A	10%	12.1%	14.4%
Indonesia	BBB	9%	9.1%	14.7%
Botswana	BBB+	7%	9.5%	15.0%
Morocco	BBB-	10%	12.8%	15.1%
Mauritius	BBB-	11%	12.9%	16.5%
Italy	BBB	8%	11.6%	17.2%
India	BBB-	9%	11.4%	17.2%
Hungary	BBB	10%	13.4%	18.0%
Panama	BBB	7%	13.7%	19.3%
Vietnam	BB	12%	14.0%	19.4%
Paraguay	BB+	10%	15.0%	20.6%
Greece	BB+	12%	15.3%	20.9%
Peru	BBB	8%	11.7%	21.3%
Brazil	BB-	14%	7.8%	22.2%
Oman	BB-	13%	17.9%	23.5%

Country	S&P Rating	Climate Investment Risk Premium (CIRP)	Cost of Debt (Climate Project)	Required Rate of Equity Return (Climate Project)
Jamaica	B+	16%	18.5%	23.7%
Bangladesh	BB-	14%	19.0%	24.6%
Ivory Coast	BB-	15%	20.2%	25.8%
South Africa	BB-	15%	20.3%	25.8%
Namibia	BB-	15%	20.7%	26.3%
Costa Rica	B	16%	20.7%	26.3%
Cambodia	B	16%	22.2%	27.7%
Senegal	BB-	15%	22.5%	28.1%
Ghana	B-	19%	22.7%	28.3%
Bahrain	B	17%	23.5%	29.1%
Bolivia	B+	16%	23.7%	29.2%
Tanzania	B	18%	24.1%	29.6%
Nigeria	B+	17%	25.2%	30.8%
Cameroon	B	17%	26.0%	31.6%
Egypt	B	18%	29.5%	35.1%
Venezuela	C	50%	30.1%	35.6%
Uganda	B+	17%	30.2%	35.8%
Mozambique	CCC+	22%	32.8%	38.3%
Tunisia	CCC+	23%	36.5%	42.1%
Sri Lanka	D	16%	38.1%	43.7%
Zambia	CCC-	29%	45.4%	51.0%
Argentina	CCC+	24%	54.1%	59.7%

7. ANNEX III: SIZING THE RISK MITIGATING CREDIT GUARANTEE FACILITY

Country	Government Solar Target Estimate (GW)	S&P Credit Rating	S&P 10 year Default Rate
Saudi Arabia	40	A-	1.20%
Brazil	30	BB-	15.48%
Israel	20	A+	0.93%
Algeria	13.6	B	22.91%
Vietnam	12	BB	10.06%
UAE	12	AA	0.86%
Egypt	6	B	22.91%
Morocco	6	BBB-	4.83%
Chile	5	A	1.27%
Indonesia	4.82	BBB	2.75%
Tunisia	3.8	CCC+	51.05%
Oman	3	BB-	15.48%
Peru	3	BBB	2.75%
Uganda	2.4	B+	20.73%
Nigeria	2	B+	20.73%
Panama	1.7	BBB	2.75%
Sri Lanka	1.5	D	100.00%
Tanzania	1.5	B	22.91%
Bolivia	1.2	B+	20.73%
Zambia	1	CCC-	51.05%
Cambodia	1	B	22.91%
Paraguay	0.7	BB+	6.18%
Bangladesh	0.6	BB-	15.48%
Ghana	0.5	B-	30.34%
Namibia	0.5	BB-	15.48%

Country	Government Solar Target Estimate (GW)	S&P Credit Rating	S&P 10 year Default Rate
Ivory Coast	0.4	BB-	15.48%
Senegal	0.4	BB-	15.48%
Mauritius	0.36	BBB-	4.83%
Jamaica	0.35	B+	20.73%
Cameroon	0.3	B	22.91%
Bahrain	0.3	B	22.91%
Botswana	0.25	BBB+	1.99%
Costa Rica	0.2	B	22.91%
Venezuela	0.1	C	51.05%
Mozambique	0.1	CCC+	51.05%
Total (GW)	**176.6**		

CREDIT GUARANTEE FACILITY SIZING

Rounded-off Total (GW)	**175**
Project Cost per MW (US$ mm)	1
Total Capital Required (US$ bn)	**175**
Debt % of Total Capital	70%
Equity % of Total Capital	30%

Total Debt Required (US$ bn) – 70% of $175 bn (rounded)	**120**
10-year Weighted Average Default Rate	**11%**
Expected Loss (US$ bn) (rounded)	**13**
% Debt Covered by Credit Guarantee Facility	50%
Total Debt Covered by Credit Guarantee Facility (US$ bn)	60
Size of Guarantee Facility (US$ bn) – 11% of 60bn	**6.6**
% Funded Capital (balance is Callable Capital)	10%
Funded Capital for Guarantee Facility (US$ bn)	**0.7**
Unfunded/Callable Capital (US$ bn)	**5.9**
Leverage on Funded Capital ($175bn / $0.7bn)	**250x**
Possible Source for Funded Capital	**GCF**
Possible Source for Unfunded/Callable Capital	**Donor countries pro-rated by emissions**

8. ANNEX IV-1: IMPACT OF GUARANTEE OF CREDIT RATING & RISK PREMIUM (APPROACH 1)

Country	Current S&P Rating	Enhanced S&P Rating	Rating Notches Improved	Reduction in Climate Investment Risk Premium
Zambia	CCC-	BBB-	9	18%
Argentina	CCC+	BBB	8	14%
Tunisia	CCC+	BBB	8	13%
Mozambique	CCC+	BBB	8	12%
Ghana	B-	BBB+	8	11%
Tanzania	B	BBB+	7	10%
Egypt	B	BBB+	7	10%
Cameroon	B	BBB+	7	9%
Bahrain	B	BBB+	7	9%
Nigeria	B+	BBB+	6	9%
Cambodia	B	BBB+	7	9%
Uganda	B+	BBB+	6	9%
Costa Rica	B	BBB+	7	9%
Sri Lanka	D	BB	10	8%
Bolivia	B+	BBB+	6	9%
Jamaica	B+	BBB+	6	8%
South Africa	BB-	A-	6	8%
Namibia	BB-	A-	6	8%
Ivory Coast	BB-	A-	6	7%
Senegal	BB-	A-	6	7%
Brazil	BB-	A-	6	7%
Bangladesh	BB-	A-	6	7%
Oman	BB-	A-	6	7%
Greece	BB+	A	5	6%
Vietnam	BB	A-	5	6%
Paraguay	BB+	A	5	5%
Mauritius	BBB-	A+	5	5%

Country	Current S&P Rating	Enhanced S&P Rating	Rating Notches Improved	Reduction in Climate Investment Risk Premium
Morocco	BBB-	A+	5	5%
Hungary	BBB	A+	4	5%
India	BBB-	A+	5	4%
Indonesia	BBB	A+	4	4%
Italy	BBB	A+	4	3%
Botswana	BBB+	AA-	4	3%
Peru	BBB	A+	4	3%
Panama	BBB	A+	4	3%
Saudi Arabia	A-	AA-	3	2%
Chile	A	AA-	2	2%
Israel	A+	AA	2	2%
Australia	AAA	AAA	0	1%
France	AA	AA+	1	2%
Sweden	AAA	AAA	0	1%
Netherlands	AAA	AAA	0	1%
UAE	AA	AA+	1	1%
USA	AA+	AA+	0	0%
Germany	AAA	AAA	0	0%
Norway	AAA	AAA	0	0%
Average			5.6	6%

9. ANNEX IV-2: IMPACT OF GUARANTEE OF CREDIT RATING & RISK PREMIUM (APPROACH 2)

Country	Current S&P Rating	Enhanced S&P Rating	Rating Notches Improved	Reduction in Premium
Zambia	CCC-	B-	3	8%
Argentina	CCC+	B+	3	6%
Tunisia	CCC+	B+	3	5%
Mozambique	CCC+	B+	3	6%
Ghana	B-	BB-	3	5%
Tanzania	B	BB	3	5%
Egypt	B	BB	3	5%
Cameroon	B	BB	3	5%
Bahrain	B	BB	3	5%
Nigeria	B+	BB+	3	5%
Cambodia	B	BB	3	4%
Uganda	B+	BB+	3	4%
Costa Rica	B	BB	3	4%
Sri Lanka	D	CCC+	5	4%
Bolivia	B+	BB+	3	4%
Jamaica	B+	BB+	3	4%
South Africa	BB-	BB+	2	3%
Namibia	BB-	BB+	2	3%
Ivory Coast	BB-	BB+	2	3%
Senegal	BB-	BB+	2	3%
Brazil	BB-	BB+	2	3%
Bangladesh	BB-	BB+	2	3%
Oman	BB-	BB+	2	2%
Greece	BB+	BBB	2	3%
Vietnam	BB	BBB-	2	2%
Paraguay	BB+	BBB	2	2%
Mauritius	BBB-	BBB+	2	2%

Country	Current S&P Rating	Enhanced S&P Rating	Rating Notches Improved	Reduction in Premium
Morocco	BBB-	BBB+	2	2%
Hungary	BBB	A-	2	2%
India	BBB-	BBB+	2	2%
Indonesia	BBB	A-	2	2%
Italy	BBB	A-	2	2%
Botswana	BBB+	A	2	2%
Peru	BBB	A-	2	2%
Panama	BBB	A-	2	2%
Saudi Arabia	A-	A+	2	1%
Chile	A	A+	1	1%
Israel	A+	AA-	1	1%
Australia	AAA	AAA	0	1%
France	AA	AA+	1	1%
Sweden	AAA	AAA	0	1%
Netherlands	AAA	AAA	0	1%
UAE	AA	AA+	1	1%
USA	AA+	AA+	0	0%
Germany	AAA	AAA	0	0%
Norway	AAA	AAA	0	0%
Average			2.4	3%

10. ANNEX V: MAPPING SOLAR RADIATION POTENTIAL AND SOLAR INSTALLED CAPACITY

Country	Total Potential (TWh)	Installed Capacity/Area (kW/km2)
Australia	16.424	2.37
USA	16.071	8.35
Brazil	15.394	0.94
China	15.243	27.42
Canada	10.647	0.36
India	5.670	13.00
Algeria	5.215	0.21
Argentina	4.865	0.37
Saudi Arabia	4.721	0.19
Congo	4.122	0.00
Libya	3.973	0.17
Sudan	3.956	0.00
Mexico	3.924	2.95
Indonesia	3.159	0.11
Niger	3.006	0.00
Chad	2.900	0.00
South Africa	2.608	5.00
Egypt	2.302	2.00
Peru	2.301	0.23
Ethiopia	2.103	0.00
Columbia	1.797	0.10
Pakistan	1.782	1.11
Nigeria	1.709	0.11
Turkey	1.380	8.75
Kenya	1.292	0.17
Thailand	0.920	6.00

Country	Total Potential (TWh)	Installed Capacity/Area (kW/km2)
Spain	0.890	28.00
France	0.761	20.00
Vietnam	0.545	56.67
Malaysia	0.529	5.00
Japan	0.496	167.50
Germany	0.375	154.29
Norway	0.363	0.50
New Zealand	0.331	0.38
UK	0.230	58.33
South Korea	0.147	150.00
Denmark	0.039	32.50
Belgium	0.032	200.00
Netherlands	0.031	333.33

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