

**CDM-MP92-A03**

# Draft Methodological tool

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## Investment analysis

Version 13.0

DRAFT



**United Nations**  
Framework Convention on  
Climate Change

## COVER NOTE

### 1. Procedural background

1. The Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board), at its 85th meeting, requested the Methodologies Panel (MP) to revise the tool “Investment analysis” to identify the host countries where the cost of equity may be calculated using the capital asset pricing model (CAPM).
2. The Board also requested that the default values for the cost of equity should be updated annually, based on the latest available database.
3. In addition, at its 116<sup>th</sup> meeting, the Board requested the MP to revise the tool for editorial, consistency and structural improvement.

### 2. Purpose

4. The purpose of the draft revision is to:
  - (a) Update the default values for the cost of equity based on the latest available data set;
  - (b) Undertake editorial, consistency and structural improvements.

### 3. Key issues and proposed solutions

5. The default values for the cost of equity are calculated based on the the following:
  - (a) Risk free rate of return, based on the long-term average returns of US treasury bonds;
  - (b) Equity risk premium, derived from the long-term historical returns on equity in the US market;
  - (c) Country risk premium, calculated based on Moody’s rating, for those countries with an available rating. For countries without a Moody’s rating, an algorithm developed by the Secretariat is used to derive the values, based on latest available macroeconomic data from the World Bank, the International Monetary Fund and Fragile State Index.
6. The revision includes editorial, consistency and structural improvements.

### 4. Impacts

7. The update of the default values for the cost of equity will ensure the use of the latest data by the project participants when conducting an investment analysis.
8. The proposed revision improves the clarity and streamlines the usability of the tool by project participants.

**5. Subsequent work and timelines**

9. The MP, at its 92nd meeting, agreed to seek public inputs on the draft revised methodological tool TOOL27. Inputs received, if any, will be discussed with the MP and forwarded to the Board for its consideration together with this document. No further work is envisaged.

**6. Recommendations to the Board**

10. The MP recommends that the Board approve the proposed revision to TOO27, to be made effective at the time of the Board's approval.

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## 1. Introduction

### 1.1. Background

1. In consideration of issues identified through requests for review and reviews of requests for registration the CDM Executive Board (hereinafter referred to as the Board) considers it necessary. This methodological tool provides guidance and specific requirements for the preparation, and presentation and validation of investment analysis in demonstrating additionality of CDM project activities and programmes of activities (PoAs).

## 2. Scope, applicability, and entry into force

### 2.1. Scope and applicability

2. This methodological tool is applicable to CDM project activities and programmes of activities (PoAs) that conduct an investment analysis. ~~apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", the guidelines "Non-binding best practice examples to demonstrate additionality for SSC project activities", or baseline and monitoring methodologies that use the investment analysis~~ for the demonstration of additionality and/or the identification of the baseline scenario.
3. In case the applied approved baseline and monitoring methodology contains requirements for the investment analysis that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.

### 2.2. Entry into force

4. The date of entry into force is the date of the publication of the EB XX meeting report on DD Month YYYY.

## 3. Definitions

5. The definitions contained in the Glossary of CDM terms shall apply.

## 4. General ~~issues in calculation and presentation~~ requirements

### 4.1. Presentation

6. The investment analysis shall be presented in a transparent manner, as a workable and reproduceable spreadsheet. All the formulas applied shall be traceable and all relevant cells shall be readable and unprotected.
7. The calculation spreadsheet and supporting documents are to be made publicly available. In case the investment analysis contains confidential information, a read-only or PDF copy may be provided with black-out elements, and proper justification shall be provided by the validating DOE.

8. The investment analysis shall be conducted in a consistent manner, based on a benchmark that is relevant for the type of financial indicator selected. When post-tax benchmarks are used, investment analysis shall be conducted based on post-tax cash flows. Where investment analysis is carried out in nominal terms, but the benchmark is only available in real terms, it shall be converted to the nominal value by applying an appropriate inflation rate.

#### 4.2. Assessment period

9. The period of assessment should not be limited to the proposed crediting period of the CDM project activity. Both project internal rate of return (IRR) and equity IRR calculations should reflect the period of expected operation of the underlying project activity (technical lifetime) and if a shorter period than the technical lifetime is chosen, the investment analysis shall be conducted for at least 10 years and include the fair value of the project activity assets at the end of the assessment period. The IRR calculation may include the cost of major maintenance and/or rehabilitation if these are expected to be incurred during the period of assessment. The period of assessment shall be determined appropriately to assess whether the proposed activity would be financially viable without the incentive of the CDM. The period of assessment shall be no less than 10 years and must cover the entire technical lifetime of the proposed activity, which may extend beyond the crediting period.
10. **Rationale:** The purpose of undertaking an investment analysis is to determine whether or not the project activity would be financially viable without the incentive of the CDM. The actual project activity is not limited in time to the crediting period being requested.
11. ~~The fair value of any project activity assets at~~ In cases where the capital expenditures have not fully devalued by the end of the assessment period, the fair value of any asset shall be reflected as a cash inflow in the final year. ~~The fair value should shall be calculated in accordance with the local accounting regulations, where available or international best practice. It is expected that such fair value calculations will include both the book value of the asset and the reasonable expectation of the potential profit or loss on the realization of the assets.~~  
**Rationale:** Net Present Value (NPV) or Internal Rate of Return (IRR) calculations are designed to calculate the return on the cost of investment, in cases where the capital expenditures have not been fully devalued this should be reflected as a cash inflow. Not to apply a residual value would imply that the project must repay the full value of the capital expenditure before the value of this expenditure had been consumed.
12. The discount rate used in the investment comparison analysis shall be determined following the requirements as set out in this tool for the calculation of IRR benchmarks in section 6 below.
13. ~~The weighted average costs of capital (WACC) and the cost of equity provided in the Appendix or calculated using Capital Asset Pricing Model (CAPM) are post-tax IRR benchmarks, and investment analysis shall be conducted with post-tax cash flows. Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, shall be added back to net profits for the purpose of calculating the financial indicator (e.g. IRR, NPV). The cash flow effects of taxation should be included in the IRR/NPV calculation.~~

**Rationale:** Depreciation is not an actual expense incurred by the company and as such does not directly affect the financial viability of the project. To treat both the capital cost of the assets and their depreciation as an expense to the project would be a double counting of this cost.

#### 4.3. Data vintage

14. The input values used in all the investment analysis and the benchmark shall be valid and applicable at the time of the investment decision taken by the project participant, which must be based on the latest information that is available at that point in time. The DOE is therefore expected to validate the timing of the investment decision and the consistency and appropriateness of the input values with this timing. The DOE should also validate that the listed input values have been consistently applied in all calculations.

**Rationale:** The use of investment analysis to demonstrate additionality is intended to assess whether or not a reasonable investor would or not decide to proceed with a particular project activity without the benefits of the CDM. This decision will therefore be based on the relevant information available at the time of the investment decision and not information available at an earlier or later point. Any expenditures occurred prior to the decision to proceed with the investment in the project will not impact the final investment decision as such expenses sunk costs which remain unaffected by the decision to proceed or not with a project activity.

15. In the case of project activities for which the implementation of a project ceases after the commencement and where implementation is only recommenced due to after consideration of the incentive of the CDM, the investment analysis should shall reflect the economic decision-making context at point of the time the decision to recommence the project is made. Therefore, Any capital costs incurred prior to the revised project activity start date restart of the project activity can may be reflected as the fair recoverable value of the assets, which are limited to the potential reuse/resale of tangible assets.<sup>†</sup>

**Rationale:** At the point of taking a decision to restart implementation of a project as a CDM project activity, the key issue of interest to an investor is the costs and revenues including the incentives from the CDM accruing from continuation of the investment.

16. Project participants shall supply spreadsheet versions of all investment analysis. All formulas used in this analysis shall be readable and all relevant cells shall be viewable and unprotected. The spreadsheet will be made available to the Board, UNFCCC secretariat and others contracted to assess the request for registration on behalf of the Board including assigned members of the Registration and Issuance Team. In cases where the project participant does not wish to make such a spreadsheet available to the public an exact read-only or PDF copy shall be provided for general publication. In case the project participant wishes to black-out certain elements of the publicly available version, a clear justification for this shall be provided to the secretariat by the DOE when requesting registration.

**Rationale:** Investment analysis shall be presented in a transparent manner, to the extent that the reader can reproduce the results.

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<sup>†</sup>—Capital expenditures should be included not at the original investment costs but at the market fair value at the point of the decision to proceed with the investment, demonstrating the value through assessments done by chartered specialists.

## 5. Application of Project IRR and Equity IRR Financial indicators

17. The investment analysis shall be conducted based on a financial indicator that is suitable for the proposed project activity and consistent with the type of benchmark (or discount rate) selected in accordance with section 6 below. For example, net present value (NPV), project IRR and equity IRR, as detailed below.
18. The financial indicator shall be calculated taking into account the major expenditures directly associated with the project and all expected sources of income and cost savings.
19. When depreciation, or other non-cash items are deducted from the estimated gross profits for tax calculation, they shall be added back when calculating the cash flows to avoid double counting of the capital expenditure.

### 5.1. Net present value (NPV)

20. The net present value (NPV) is the balance of the present values of cash inflows and outflows during the assessment period and it represents the total value of an investment opportunity.
21. In calculating the NPV, project participants shall apply an appropriate discount rate, calculated according to the procedures described in section 6 below.

### 5.2. Project IRR

22. The cost of financing expenditures (i.e. loan repayments and interest) shall not be included in the calculation of project IRR. The project IRR can be compared against the weighted average cost of capital to determine the viability of the proposed activity to generate return and service debt, based on all projected capital expenditures and the series of cash flows throughout the assessment period.
23. The cost of financing expenditures (i.e. loan repayments and interest) shall not be included in the calculation of project IRR.
24. The calculation of the project IRR shall not take into account any costs associated with the financing of the project (including the cost of finance would lead to double counting this expenditure in the analysis).

**Rationale:** The purpose of the project IRR calculation is to determine the viability of the project to service debt. Therefore, to include the cost of financing as an expense in this calculation would result in a double counting of this cost in the ultimate analysis.

### 5.3. Equity IRR

25. In the calculation of equity IRR The equity IRR is the rate of return on the equity invested in a project activity. Therefore, the analysis considers only the portion of investment costs financed by equity (i.e. the cost of equity). The costs associated with the servicing of debt (interest expenses and principle repayment) are accounted as costs. Only the portion of investment costs which is financed by equity should be considered as the net cash outflow, the portion of the investment costs which is financed by debt should not be considered a cash outflow.



26. **Rationale:** The purpose of the equity IRR calculation is to determine the final return on the initial equity investment. In such calculations the cost of servicing debt (interest and principle payments) are considered as costs. Therefore, to consider all investment costs to be a cash outflow would double count the cost of debt to the equity investor.

## 6. Selection and Validation of Appropriate Benchmarks

27. The project participants shall identify an appropriate benchmark that is consistent with the financial indicator selected for the analysis.
28. The applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or WACC are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for an equity IRR. Benchmarks supplied by relevant national authorities are also appropriate. The DOE shall validate that the benchmarks used are applicable to the project activity and the type of IRR calculation presented. The benchmark shall be sourced from information that is available to the project participant at the time of the investment decision.

$$WACC = r_e \times W_e + r_d \times W_d \times (1 - T_e) \quad \text{Equation (1)}$$

Where:

$r_e$	=	Cost of equity (-)
$W_e$	=	Percentage of financing that is equity (-)
$r_d$	=	Cost of debt (-)
$W_d$	=	Percentage of financing that is debt (-)
$T_e$	=	Corporate tax rate (-)

**Rationale:** For the same project activity, the project IRR and equity IRR will be different, therefore the benchmark shall be appropriate to the type of calculation applied.

29. In situations where an investment analysis is carried out in nominal terms and, but the available IRR benchmarks are in real terms, project participants shall convert the real term values of benchmarks to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used. To convert from real to nominal costs of capital, the expected inflation rate shall be used. The inflation rate can be based on the long-term inflation forecast for the assessment period shall be sourced from national authorities of the host country, if available. Otherwise, the inflation target for the country may be used. Alternatively, the inflation rate may be obtained from multilateral organizations (e.g. International Monetary Fund, World Bank).
30. In the cases of projects which could where a given project activity can be developed by an entity entities other than the project participant, the benchmark should shall be determined for the specific project activity based on using parameters that are standard in the market. The DOE's validation of the benchmark shall also include its opinion on

whether a company-specific benchmark or a benchmark based on parameters that are standard in the market is suitable in the context of the underlying project activity.

**Rationale:** If the project could be developed by a different entity the unwillingness of one investor to assume the associated risks is not sufficient evidence that the project is additional, as this may be based on the subjective profit expectations of that investor. The applied benchmark must be suitable for the specific proposed project activity. It is not suitable to compare the return of low risk investments with the returns achieved or achievable by higher risk investments.

31. If there is only one possible project developer a given project activity can only be developed by the project participant, either internal company benchmarks/expected returns a company-specific benchmark may be applied, or the benchmark based on standard conditions in the market may be used. If internal company benchmarks/expected returns are used, it should be demonstrated to have been that is consistent with the benchmark used for similar projects with similar risks, developed by the same company or, if the company is brand new, would have been used for similar projects in the same sector in the country/region. This shall require as a minimum clear evidence of the resolution by the company's Board and/or shareholders and require the validating DOE to undertake a thorough assessment of the financial statements of the project developer to assess the past financial behaviour during at least the previous 3 years.

**Rationale:** The Tool for the demonstration and assessment of additionality requires that benchmarks should not include the subjective profitability expectations or risk profile of a particular project developer. Note that a company's internal benchmark can be derived in different ways, however, values derived based on such approaches should only be used if the resulting benchmarks were consistently used by the company in the past.

## 6.1. The cost of capital: Weighted Average Cost of Capital (WACC)

32. The cost of capital is calculated as the average rate of the costs of debt and equity, weighted by the proportions of respective market values.

$$WACC = r_e \times W_e + r_d \times (1 - T_c) \times W_d \quad \text{Equation (2)}$$

Where:

$r_e$	=	Cost of equity (-)
$W_e$	=	Proportion of financing that is equity (%)
$r_d$	=	Cost of debt (-)
$W_d$	=	Proportion of financing that is debt (%)
$T_c$	=	Corporate tax rate (-)

## 6.2. Cost of equity (expected return on equity) in the market

33. If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in the Appendix; or by

(b) calculating the cost of equity using CAPM.<sup>2</sup> The default values in the Appendix are based on long term historical returns and therefore may also be applied by projects with a start date prior to the adoption of the default values by the Board. If the benchmark is to be based on parameters that are standard in the market, project participants may select a relevant default value provided in Table 1 of the Appendix.

34. **Rationale:** The values in the Appendix reflect, as an approximate value, the returns on equity expected by the market for different sectors and countries. The expectation of return depends on conditions of the market that can be modelled, taking into account the history (time series) of the market key variables (explaining variables proper of the technology and/or sector under analysis).

35. Alternatively, project participants may calculate the cost of equity using the capital asset pricing model (CAPM)<sup>3</sup> The cost of equity may be calculated using CAPM if all of the following conditions are satisfied met, according to the most recent datasets from the World Federation of Exchanges and the Gross Domestic Product (GDP) from the World Bank or UNSTAT. In addition, the countries meeting the criteria (a)-(c) and (e) are also indicated in the table in the Appendix:

- a) More than 10 years of existence for the The domestic stock exchange has existed for more than 10 years in the host country;
- b) The stock market is representative of the domestic economy, i.e. ratio of stock market capitalization to GDP is in excess of 20 per cent with a capitalization of at least 20 per cent of the GDP;
- c) The average share turnover ratio (the ratio in which stocks are traded) over the last calendar year is in excess of 20 per cent;
- d) There are at least three domestic pure players that belong actors dedicated to the same sector as that of the project activity<sup>4</sup> to calculate beta with at least 3 years of daily stock market data, and daily values are available; and
- e) There are domestic government securities labelled denominated in the domestic currency with maturities over 10 years.

**Rationale for the individual conditions above:**

- (a) For market return, it allows to include relatively recent but quite active stock exchanges;
- (b) For market return, this level is relatively low on purpose to ensure that countries that have not been undergoing multiple waves of privatization but still offer domestic private sector investment opportunities be included;

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<sup>2</sup> Adjustment to the CAPM or use of other financial models may be proposed through a request of revision of the Tool for the demonstration and assessment of additionality.

<sup>3</sup> Adjustment to the CAPM or use of other financial models may be proposed through a request for revision of the Tool for the demonstration and assessment of additionality.

<sup>4</sup> If this data requirement cannot be met, the sector may be defined more broadly, e.g. by extending from the solar PV sector to the renewable energy sector and even to the utilities sector, so that at least three playersactors can be identified.

- (c) For market turnover, a ratio in excess of 100 per cent means that a single stock is traded more than once per year / a ratio of 20 per cent means that, on average, one stock out of five changes hands every year;
- (d) Minimum information required to calculate beta;
- (e) For risk-free rate, the maturity of such security should not be significantly lower than the project lifetime.

36. The application of CAPM to calculate the cost of equity shall follow the equation below, and should use official data sources from financial institutions (central banks, stock exchanges, etc.) as preferred choice over third party sources:

$$r_e = r_f + \beta \times (r_m - r_f) \quad \text{Equation (3)}$$

Where:

- $r_e$  = Cost of equity (-)
- $r_f$  = Risk-free rate (-). It shall be based on local sovereign debt and shall have a maturity date close to the project lifetime (at least 10 years) and sufficient liquidity. The latest (rather than the average over a time horizon) sovereign debt data available at the time of the investment decision should be used
- $\beta$  = Beta (-). The beta shall be calculated as the weighted arithmetic average of the beta of all the pure players-actors in the host country that have been in business in the sector of the project activity for at least 3 years and over the longest common lifetime for the companies in the sample of pure players, weighted by their respective total capitals (i.e. equity and long-term debt) of the pure players. Every pure player that meets the abovementioned criteria and that belongs to the same sector as defined in the previous paragraph shall be accounted for and used in the beta calculation. The individual betas shall be calculated independently without deleveraging by the debt-equity ratios of the pure players
- $r_m$  = Expected market return. It shall be calculated using the average of the following three annualized rates of return of stock market<sup>5</sup>, for (1) the longest time series available, (2) a 20-year horizon (if existing), and (3) a 10-year horizon (if existing). Daily values shall be used. Should there be multiple stock exchange indices, stock issues for a given company, or sovereign debt issues, the most liquid or most frequently traded one shall be used. For stock market indices, liquidity is assessed with the volume of trading for the component stock issues

### 6.3. Cost of debt

37. If a company's internal benchmark is used for the expected return on equity, If the benchmark is to be based on an internal required/expected return, the cost of debt for the proposed activity should shall be based on its corresponding weighted average over the

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<sup>5</sup> In case there are multiple stock exchange indices available, or multiple stock issued for a given company, or sovereign debt issued, the most liquid (volume) or most frequently traded one shall be used.

total cost of debt financing of the legal entity owning the CDM project activity project participant, and taking into account:

- (a) For loans, use the weighted average cost of outstanding long-term debt;
- (b) For bonds (issued in the host country), use the weighted average yield of the bonds during the last three months prior to the submission of the CDM-PDD for validation or prior to the investment decision, whichever is earlier. The use of bonds to determine the cost of debt is only appropriate for corporate bonds issued in the host country of the CDM project;
- (c) In cases where the debt finance structure of the project (or the entity owning the project) is not yet available (e.g. a letter of intent for debt funding is not available), the cost of debt can may be assumed as the commercial prime lending rate in the country or the yield of a 10-year bond issued by the government of the host country or, if this is not available, the bond with the maturity which is closest to 10 years.

38. The following should be documented in the CDM-PDD:

- (a) For bonds: the key parameters of the bond including the time of maturity, yield, registration issuance in the financial system and set-up in the market;
- (b) For loans from a financial institution: the contract of lending between the financial institution and the legal entity owning the assets of the project activity, or, in absence of the contract, a letter from the bank stating its intention to award the loan and the key terms for the loan;
- (c) For debt financing from a parent company: the transfer of capital to the legal entity, documented with the contract of lending between the parent company and the legal entity owning the assets of the project activity and/or the parameters of the corporate bonds as mentioned above. This latter option is only valid for corporate bonds issued in the host country of the CDM project activity.

**Rationale:** Interest rates charged on loans are dependent upon a company's specific credit rating. Hence company specific interest rates are only relevant for projects with only one possible project developer.

39. If the benchmark is to be based on parameters that are standard in the market, the cost of debt should shall be calculated as based on the cost of financing in the capital markets (e.g. commercial lending rates and guarantees required for the country and for the type of project activity concerned), based on documented evidence from financial institutions with regard to the cost of debt financing of comparable projects multilateral organizations (e.g. International Monetary Fund, World Bank). In cases where such data is not available, use the commercial prime lending rate in the host country may be used to calculate the cost of debt.

#### 6.4. Weighting of debt and equity

40. If a company's internal benchmark is used for the expected return on equity cost of capital, then the percentage of debt financing and equity financing should shall reflect the market values of the long-term debt/equity finance structure of the legal entity owning the assets of the project activity at the time of the investment decision. The percentage should be determined based on the latest balance sheet provided under local fiscal/accounting

standards and rules if: (a) the legal entity owning the assets of the project activity has balance sheets audited by a third party within two years prior to the submission of the GDM-PDD for validation; and (b) the accounting books of the legal entity reflect at least the total value of all the assets needed for the project activity. If the debt/equity finance structure is not yet available, 50 per cent debt and 50 per cent equity financing may be assumed as a default.

41. If the benchmark is based on parameters that are standard in the market, then the typical debt/equity finance structure observed in the sector where the project activity falls in of the country, should be used. If such information is not readily publicly available, 50 per cent debt and 50 per cent equity financing may be assumed as a default.

## 7. Sensitivity analysis

42. Variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Where a DOE considers that a variable which constitute less than 20 per cent has a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis. A sensitivity analysis shall be carried out in order to assess the impact of potential variations of the main assumptions on the outcome of the investment analysis.

**Rationale:** The initial objective of a sensitivity analysis is to determine in which scenarios the project activity would pass the benchmark or become more favourable than the alternative.

43. The DOE should assess in detail whether the range of variations is reasonable in the project context. Past trends may be a guide to determine the reasonable range. As a general point of departure variations in the sensitivity analysis should at least cover a range of +10 per cent and -10 per cent, unless this is not deemed appropriate in the context of the specific project circumstances. In cases where a scenario will result in the project activity passing the benchmark or becoming the most financially attractive alternative the DOE shall provide an assessment of the probability of the occurrence of this scenario in comparison to the likelihood of the assumptions in the presented investment analysis, taking into consideration correlations between the variables as well as the specific socio-economic and policy context of the project activity. The main input values to the investment analysis (e.g. investment costs, operation and maintenance costs, production volumes, tariff or other revenues) shall be subject to a variation of +/- 10 per cent.

**Rationale:** The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis.

44. In cases where the applied variation causes the IRR to surpass the benchmark or the NPV to exceed zero, the likelihood of such variation must be assessed and explained, taking into account possible correlations between variables or specific circumstances.

## Appendix. Default values for the cost of equity (expected return on equity)

45. The table below provides default values for the approximate expected return on equity for different project types and host countries. The expected return on equity is composed of four elements: (a) risk-free rate of return; (b) equity risk premium; (c) country risk premium; and (d) an adjustment factor to reflect the risk of projects in different sectoral scopes.
46. The default values for the cost of equity or expected return on equity in the host country are calculated based on the following parameters:
- (a) Risk-free rate of return: calculated based on the inflation adjusted geometric average of return on the long-term US government bonds for 1973 - 2022<sup>1</sup>. A value of 3.1 per cent is used.<sup>2</sup>
  - (b) Equity risk premium: derived from the inflation-adjusted geometric average return on equity in the US market relative to the return on the long-term US government bonds for 1973 - 2022. A value of 2.7 per cent is used.<sup>3</sup>
  - (c) Country risk premium: estimated using Moody's rating, for countries with available rating<sup>4</sup>, PRS Composite Risk Score for frontier markets and Fitch rating where neither is available. For countries where none of the above is available, a statistical algorithm developed by the Secretariat is used to derive the values, based on the latest available macroeconomic data<sup>5</sup> published by the World Bank, IMF and the Fragile State Index (these countries are marked with an asterisk on the table below).
  - (d) Sectoral adjustment factors: reflect the different risk levels across sectoral scopes.
47. The risk-free rate of return is calculated based on the inflation adjusted geometric average of return on the long-term US government bonds for 1972 - 2021<sup>6</sup>. A value of 3.9 per cent is used.<sup>7</sup>

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<sup>1</sup> USA dollar values are used as it has the longest recorded historical data for both government bonds and stock markets.

<sup>2</sup> Credit Suisse Global Investment Returns Yearbook 2022-2023 – summary edition (page 38-40), sourced from <https://www.credit-suisse.com/about-us/en/reports-research/studies-publications.html>.

<sup>3</sup> Credit Suisse Global Investment Returns Yearbook 2022-2023 – summary edition (page 38-40), sourced from <https://www.credit-suisse.com/about-us/en/reports-research/studies-publications.html>.

<sup>4</sup> "Risk Premiums for Other Markets" – July 2022-2023  
[https://pages.stern.nyu.edu/~adamodar/New\\_Home\\_Page/datacurrent.html](https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html).

<sup>5</sup> The estimates may not reflect the most recent events or extreme circumstances experienced in some countries at the time of publication.

<sup>6</sup> USA dollar values are used as it has the longest recorded historical data for both government bonds and stock markets.

<sup>7</sup> Credit Suisse Global Investment Returns Yearbook 2022 – summary edition (page 38), sourced from <https://www.credit-suisse.com/about-us/en/reports-research/studies-publications.html>.

48. The equity risk premium is derived from the inflation adjusted geometric average return on equity in the US market relative to the return on the long-term US government bonds for 1972–2021. A value of 2.8 per cent is used.<sup>8</sup>
49. The country risk premium is estimated using Moody's rating, for those countries with available rating<sup>9</sup>, PRS Composite Risk Score for frontier markets and Fitch rating. For countries where none of the ratings are available, a statistical algorithm developed by the Secretariat is used to derive the values, based on latest available macroeconomic data<sup>10</sup> published by the World Bank, IMF and the Fragile State Index (these countries are marked with an asterisk on the table below).
50. For the purpose of determining the sectoral adjustment factor to reflect the risk of projects in different sectoral scopes, three different project categories are distinguished according to the CDM sectoral scopes used under the CDM have been grouped into 3 categories:
- (a) Group 1 (Adjustment factor: no adjustment is applied made for this Group):
1. Energy Industries;
  2. Energy Distribution;
  3. Energy Demand;
  13. Waste handling and disposal.
- (b) Group 2 (Adjustment factor: the default value cost of equity is increased by 1 percentage point for this Group):
4. Manufacturing industries;
  5. Chemical Industries;
  6. Construction;
  7. Transport;
  8. Mining/Mineral production;
  9. Metal production;
  10. Fugitive Emissions from fuels;
  11. Fugitive Emissions from production and consumption of halocarbon, and Sulphur hexafluoride;
  12. Solvent use;
  16. Carbon capture and storage of CO<sub>2</sub> in geological formations.

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<sup>8</sup> Credit Suisse Global Investment Returns Yearbook 2022 – summary edition (page 38), sourced from <https://www.credit-suisse.com/about-us/en/reports-research/studies-publications.html>.

<sup>9</sup> "Risk Premiums for Other Markets" – July 2022  
[https://pages.stern.nyu.edu/~adamodar/New\\_Home\\_Page/datacurrent.html](https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html).

<sup>10</sup> The estimates may not reflect the most recent events or extreme circumstances experienced in some countries at the time of publication.



(c) Group 3 (Adjustment factor: the cost of equity the default value is reduced by 0.5 percentage point for this Group):

14. Afforestation and reforestation;

15. Agriculture.

51. Depending on the country and sector, project participants can select the relevant benchmark value for their proposed CDM project activity. Note that the values are expressed in percentages in real terms. Table 1 below provides default values for the cost of equity or expected return on equity in the host country.

**Table 1. — Default values for the cost of equity (expected return on equity)**

Country	Group 1	Group 2	Group 3	Meeting criteria (a)-(c) and (e) in paragraph 20
Afghanistan*	17.34	18.34	16.84	
Albania	12.99	13.99	12.49	
Algeria	12.99	13.99	12.49	
Andorra	9.36	10.36	8.86	
Angola	15.79	16.79	15.29	
Argentina	23.48	24.48	22.98	
Armenia	11.73	12.73	11.23	
Azerbaijan	10.91	11.91	10.41	
Bahamas	11.73	12.73	11.23	
Bahrain	14.39	15.39	13.89	
Bangladesh	11.73	12.73	11.23	
Belize	20.68	21.68	20.18	
Benin	12.99	13.99	12.49	
Bhutan*	22.66	23.66	22.16	
Bolivia	14.39	15.39	13.89	
Bosnia and Herzegovina	15.79	16.79	15.29	
Botswana	8.38	9.38	7.88	
Brazil	10.91	11.91	10.41	¥
Brunei Darussalam	7.88	8.88	7.38	
Burkina Faso	17.18	18.18	16.68	
Burundi*	17.22	18.22	16.72	
Côte d'Ivoire	11.73	12.73	11.23	
Cambodia	14.39	15.39	13.89	
Cameroon	14.39	15.39	13.89	
Cape Verde	15.79	16.79	15.29	
Central African Republic*	24.73	25.73	24.23	
Chad*	18.12	19.12	17.62	
Chile	7.69	8.69	7.19	
China	7.69	8.69	7.19	¥
Colombia	9.36	10.36	8.86	
Comoros*	12.41	13.41	11.91	
Congo	19.29	20.29	18.79	
Cook Islands	17.18	18.18	16.68	

<b>Country</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Meeting criteria (a)-(c) and (e) in paragraph 20</b>
Costa Rica	14.39	15.39	13.89	
Cuba	23.48	24.48	22.98	
Democratic People's Republic of Korea	23.48	24.48	22.98	
Democratic Republic of the Congo	17.18	18.18	16.68	
Djibouti*	11.48	12.48	10.98	
Dominican Republic	11.73	12.73	11.23	
Ecuador	20.68	21.68	20.18	
Egypt	14.39	15.39	13.89	
El Salvador	20.68	21.68	20.18	
Equatorial Guinea*	10.04	11.04	9.54	
Eritrea*	17.59	18.59	17.09	
Ethiopia	19.29	20.29	18.79	
Fiji	12.99	13.99	12.49	
Gabon	17.18	18.18	16.68	
Gambia	12.99	13.99	12.49	
Georgia	10.91	11.91	10.41	
Ghana	17.18	18.18	16.68	
Grenada*	18.75	19.75	18.25	
Guatemala	10.20	11.20	9.70	
Guinea	19.29	20.29	18.79	
Guinea-Bissau	15.79	16.79	15.29	
Guyana	8.93	9.93	8.43	
Haiti	20.68	21.68	20.18	
Honduras	12.99	13.99	12.49	
India	9.77	10.77	9.27	Y
Indonesia	9.36	10.36	8.86	Y
Iran (Islamic Republic of)	12.99	13.99	12.49	
Iraq	17.18	18.18	16.68	
Israel	7.69	8.69	7.19	Y
Jamaica	14.39	15.39	13.89	
Jordan	12.99	13.99	12.49	
Kazakhstan	9.36	10.36	8.86	
Kenya	14.39	15.39	13.89	
Kiribati*	13.65	14.65	13.15	
Kuwait	7.69	8.69	7.19	
Kyrgyzstan	15.79	16.79	15.29	
Lao People's Democratic Republic	20.68	21.68	20.18	
Lebanon	27.10	28.10	26.60	
Lesotho	13.30	14.30	12.80	
Liberia	19.29	20.29	18.79	
Libya	10.91	11.91	10.41	
Madagascar	15.79	16.79	15.29	
Malawi	20.68	21.68	20.18	
Malaysia	8.38	9.38	7.88	Y

<b>Country</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Meeting criteria (a)-(c) and (e) in paragraph 20</b>
Maldives	17.18	18.18	16.68	
Mali	19.29	20.29	18.79	
Mauritania*	14.39	15.39	13.89	
Mauritius	9.36	10.36	8.86	
Mexico	8.93	9.93	8.43	Y
Micronesia (Federated States of)*	15.45	16.45	14.95	
Mongolia	15.79	16.79	15.29	
Montenegro	12.99	13.99	12.49	
Morocco	10.20	11.20	9.70	
Mozambique	19.29	20.29	18.79	
Myanmar	19.29	20.29	18.79	
Namibia	12.99	13.99	12.49	
Nepal*	12.62	13.62	12.12	
Nicaragua	15.79	16.79	15.29	
Niger	15.79	16.79	15.29	
Nigeria	14.39	15.39	13.89	
North Macedonia	11.73	12.73	11.23	
Oman	11.73	12.73	11.23	
Pakistan	15.79	16.79	15.29	
Panama	9.36	10.36	8.86	
Papua New Guinea	14.39	15.39	13.89	
Paraguay	10.20	11.20	9.70	
Peru	8.93	9.93	8.43	
Philippines	9.36	10.36	8.86	
Qatar	7.54	8.54	7.04	
Republic of Korea	7.39	8.39	6.89	Y
Republic of Moldova	15.79	16.79	15.29	
Republic of South Sudan*	22.07	23.07	21.57	
Rwanda	14.39	15.39	13.89	
Saint Lucia*	18.66	19.66	18.16	
Saint Vincent and the Grenadines	15.79	16.79	15.29	
Samea*	16.33	17.33	15.83	
San Marino	9.70	10.70	9.20	
Sao Tome and Principe*	18.57	19.57	18.07	
Saudi Arabia	7.69	8.69	7.19	Y
Senegal	11.73	12.73	11.23	
Serbia	10.91	11.91	10.41	
Sierra Leone	23.48	24.48	22.98	
Singapore	6.70	7.70	6.20	Y
Solomon Islands	17.18	18.18	16.68	
Somalia	23.48	24.48	22.98	
South Africa	10.91	11.91	10.41	Y
Sri Lanka	23.48	24.48	22.98	
Sudan	27.10	28.10	26.60	

Country	Group 1	Group 2	Group 3	Meeting criteria (a)-(c) and (e) in paragraph 20
Suriname	20.68	21.68	20.18	
Swaziland	15.79	16.79	15.29	
Syrian Arab Republic	27.10	28.10	26.60	
Tajikistan	15.79	16.79	15.29	
Thailand	8.93	9.93	8.43	¥
Timor-Leste*	13.81	14.81	13.31	
Togo	15.79	16.79	15.29	
Tonga*	16.21	17.21	15.71	
Trinidad and Tobago	10.91	11.91	10.41	
Tunisia	17.18	18.18	16.68	
Turkmenistan	12.10	13.10	11.60	
Uganda	14.39	15.39	13.89	
United Arab Emirates	7.39	8.39	6.89	¥
United Republic of Tanzania	14.39	15.39	13.89	
Uruguay	9.36	10.36	8.86	
Uzbekistan	12.99	13.99	12.49	
Vanuatu*	12.41	13.41	11.91	
Venezuela	27.10	28.10	26.60	
Viet Nam	11.73	12.73	11.23	¥
Yemen	27.10	28.10	26.60	
Zambia	23.48	24.48	22.98	
Zimbabwe	17.18	18.18	16.68	

**Table 2. Default values for the cost of equity (expected return on equity)**

Country	Group 1	Group 2	Group 3
Afghanistan*	24.03	25.03	23.53
Albania	12.63	13.63	12.13
Algeria	11.26	12.26	10.76
Angola	15.66	16.66	15.16
Argentina	24.01	25.01	23.51
Armenia	11.26	12.26	10.76
Azerbaijan	9.60	10.60	9.10
Bahamas	12.63	13.63	12.13
Bahrain	14.15	15.15	13.65
Bangladesh	12.63	13.63	12.13
Belize	19.46	20.46	18.96
Benin	12.63	13.63	12.13
Bhutan*	13.19	14.19	12.69
Bolivia	17.18	18.18	16.68
Bosnia and Herzegovina	15.66	16.66	15.16
Botswana	7.62	8.62	7.12
Brazil	10.37	11.37	9.87
Brunei Darussalam	6.71	7.71	6.21

Country	Group 1	Group 2	Group 3
Burkina Faso	17.18	18.18	16.68
Burundi*	21.62	22.62	21.12
Côte d'Ivoire	11.26	12.26	10.76
Cambodia	14.15	15.15	13.65
Cameroon	14.15	15.15	13.65
Cape Verde	15.66	16.66	15.16
Central African Republic*	17.33	18.33	16.83
Chad*	22.04	23.04	21.54
Chile	7.08	8.08	6.58
China	6.87	7.87	6.37
Colombia	8.69	9.69	8.19
Comoros*	17.43	18.43	16.93
Congo	19.46	20.46	18.96
Cook Islands	14.15	15.15	13.65
Costa Rica	14.15	15.15	13.65
Cuba	24.01	25.01	23.51
Democratic People's Republic of Korea	24.01	25.01	23.51
Democratic Republic of the Congo	15.66	16.66	15.16
Djibouti*	16.68	17.68	16.18
Dominican Republic	11.26	12.26	10.76
Ecuador	20.98	21.98	20.48
Egypt	15.66	16.66	15.16
El Salvador	20.98	21.98	20.48
Equatorial Guinea*	12.87	13.87	12.37
Eritrea*	15.98	16.98	15.48
Ethiopia	19.46	20.46	18.96
Fiji	12.63	13.63	12.13
Gabon	17.18	18.18	16.68
Gambia	14.15	15.15	13.65
Georgia	10.37	11.37	9.87
Ghana	24.01	25.01	23.51
Grenada*	14.15	15.15	13.65
Guatemala	9.60	10.60	9.10
Guinea	19.46	20.46	18.96
Guinea-Bissau	14.15	15.15	13.65
Guyana	8.23	9.23	7.73
Haiti	24.01	25.01	23.51
Honduras	12.63	13.63	12.13
India	9.13	10.13	8.63
Indonesia	8.69	9.69	8.19
Iran (Islamic Republic of)	15.66	16.66	15.16
Iraq	17.18	18.18	16.68
Israel	6.87	7.87	6.37
Jamaica	14.15	15.15	13.65

<b>Country</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>
Jordan	12.63	13.63	12.13
Kazakhstan	8.69	9.69	8.19
Kenya	15.66	16.66	15.16
Kiribati*	11.19	12.19	10.69
Kuwait	6.87	7.87	6.37
Kyrgyzstan	15.66	16.66	15.16
Lao People's Democratic Republic	20.98	21.98	20.48
Lebanon	30.62	31.62	30.12
Lesotho	11.25	12.25	10.75
Liberia	20.98	21.98	20.48
Libya	8.69	9.69	8.19
Madagascar	15.66	16.66	15.16
Malawi	24.01	25.01	23.51
Malaysia	7.62	8.62	7.12
Maldives	17.18	18.18	16.68
Mali	19.46	20.46	18.96
Mauritania*	15.80	16.80	15.30
Mauritius	9.13	10.13	8.63
Mexico	8.69	9.69	8.19
Micronesia (Federated States of)*	17.00	18.00	16.50
Mongolia	15.66	16.66	15.16
Montenegro	12.63	13.63	12.13
Morocco	9.60	10.60	9.10
Mozambique	19.46	20.46	18.96
Myanmar	20.98	21.98	20.48
Namibia	12.63	13.63	12.13
Nepal*	18.74	19.74	18.24
Nicaragua	15.66	16.66	15.16
Niger	15.66	16.66	15.16
Nigeria	15.66	16.66	15.16
North Macedonia	11.26	12.26	10.76
Oman	10.37	11.37	9.87
Pakistan	20.98	21.98	20.48
Panama	8.69	9.69	8.19
Papua New Guinea	14.15	15.15	13.65
Paraguay	9.60	10.60	9.10
Peru	8.23	9.23	7.73
Philippines	8.69	9.69	8.19
Qatar	6.71	7.71	6.21
Republic of Korea	6.55	7.55	6.05
Republic of Moldova	13.58	14.58	13.08
Republic of South Sudan*	22.00	23.00	21.50
Rwanda	14.15	15.15	13.65
Saint Lucia*	12.72	13.72	12.22
Saint Vincent and the Grenadines	15.66	16.66	15.16

<b>Country</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>
Samoa*	18.28	19.28	17.78
San Marino	12.94	13.94	12.44
Sao Tome and Principe*	21.82	22.82	21.32
Saudi Arabia	6.87	7.87	6.37
Senegal	11.26	12.26	10.76
Serbia	10.37	11.37	9.87
Sierra Leone	24.01	25.01	23.51
Singapore	5.80	6.80	5.30
Solomon Islands	17.18	18.18	16.68
Somalia	24.01	25.01	23.51
South Africa	10.37	11.37	9.87
Sri Lanka	24.01	25.01	23.51
Sudan	30.62	31.62	30.12
Suriname	20.98	21.98	20.48
Swaziland	15.66	16.66	15.16
Syrian Arab Republic	30.62	31.62	30.12
Tajikistan	15.66	16.66	15.16
Thailand	8.23	9.23	7.73
Timor-Leste*	17.99	18.99	17.49
Togo	15.66	16.66	15.16
Tonga*	9.08	10.08	8.58
Trinidad and Tobago	10.37	11.37	9.87
Tunisia	19.46	20.46	18.96
Turkmenistan	8.69	9.69	8.19
Uganda	14.15	15.15	13.65
United Arab Emirates	6.55	7.55	6.05
United Republic of Tanzania	14.15	15.15	13.65
Uruguay	8.69	9.69	8.19
Uzbekistan	11.26	12.26	10.76
Vanuatu*	11.91	12.91	11.41
Venezuela	30.62	31.62	30.12
Viet Nam	10.37	11.37	9.87
Yemen	20.98	21.98	20.48
Zambia	24.01	25.01	23.51
Zimbabwe	17.18	18.18	16.68

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## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
13.0	17 October 2023	<p>MP 92 Annex 3</p> <p>To be considered by the Board at EB 120.            A call for public input will be issued for this draft document. Any input will be discussed with the MP and forwarded to the Board for consideration.</p> <p>Revision to update the default values for the cost of equity and to apply editorial, consistency and structural improvements.</p>
12.0	2 November 2022	<p>EB 116, Annex 2</p> <p>Revision to update the default values for the cost of equity.</p>
11.0	1 October 2021	<p>EB 112, Annex 2</p> <p>Revision to update the default values for the cost of equity.</p>
10.0	28 November 2019	<p>EB 105, Annex 6</p> <p>Revision to update the default values for the cost of equity.</p>
09.0	29 November 2018	<p>EB 101, Annex 11</p> <p>Revision to update the default value of the cost of equity and to identify host countries where the cost of equity may be calculated using the CAPM.</p>
08.0	1 November 2017	<p>EB 97, Annex 8</p> <p>Revision to update the default values for the cost of equity.</p>
07.0	4 November 2016	<p>EB92, Annex 5.</p> <p>Revision to update the default value of the cost of equity and to identify host countries where the cost of equity may be calculated using the CAPM.</p>
06.0	24 July 2015	<p>EB 85, Annex 12</p> <p>Revision to:</p> <ul style="list-style-type: none"> <li>• Describe the conditions under which the application of capital asset pricing model (CAPM) can be considered appropriate;</li> <li>• Provide guidance on how CAPM should be applied to calculate the cost of equity;</li> <li>• Update the default values for the cost of equity in appendix;</li> <li>• Incorporate a clarification issued by the Board (EB73-A08-CLAR);</li> <li>• Include other editorial improvements;</li> <li>• Change the title to “Methodological tool: investment analysis”.</li> </ul>
05.0	15 July 2011	<p>EB 62, Annex 5</p> <p>The revision clarifies that:</p> <ul style="list-style-type: none"> <li>• In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term</li> </ul>



<i>Version</i>	<i>Date</i>	<i>Description</i>
		values provided in the table in the appendix to nominal values by adding the inflation rate;
		<ul style="list-style-type: none"><li>• The default values for the expected return on equity showed in the table in the appendix are calculated after taxes.</li></ul>
04.0	3 June 2011	EB 61, Annex 13 The revision provides further guidance on the calculation of the expected return on equity, the cost of debt and the percentage of equity and debt funding. The revision also includes a new Appendix with default values for the expected return on equity.
03.1	15 January 2010	EB 51, Annex 58 Editorial changes.
03.0	04 December 2009	EB 51, Annex 58 Revision to provide guidance on the treatment of interest payments in income tax calculations.
02.1	02 August 2008	EB 41, Annex 45 Revision to insert annex number.
02.0	02 August 2008	EB 41, Annex 45 Revision to provide guidance on the treatment of costs incurred prior to the project activity start date.
01.0	6 May 2008	EB 39, Annex 35 Initial adoption.

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Document Type: Tool  
Business Function: Registration, Methodology  
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