



EU-China CDM Facilitation Project Workshop on Validation

CDM Tools

Beijing

November 14th, 2007

Prof. Dr. Günter Schock
TÜV Rheinland Group

► Methodological Tools (without A/R)

EB28 Tool to determine project emissions from flaring gases containing methane

EB28 Combined tool to identify the baseline scenario and demonstrate additionality (version 02)

EB29 Tool for the demonstration and assessment of additionality (version 03)

EB32 Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion

EB35 Tool to calculate the emission factor for an electricity system

EB35 Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site

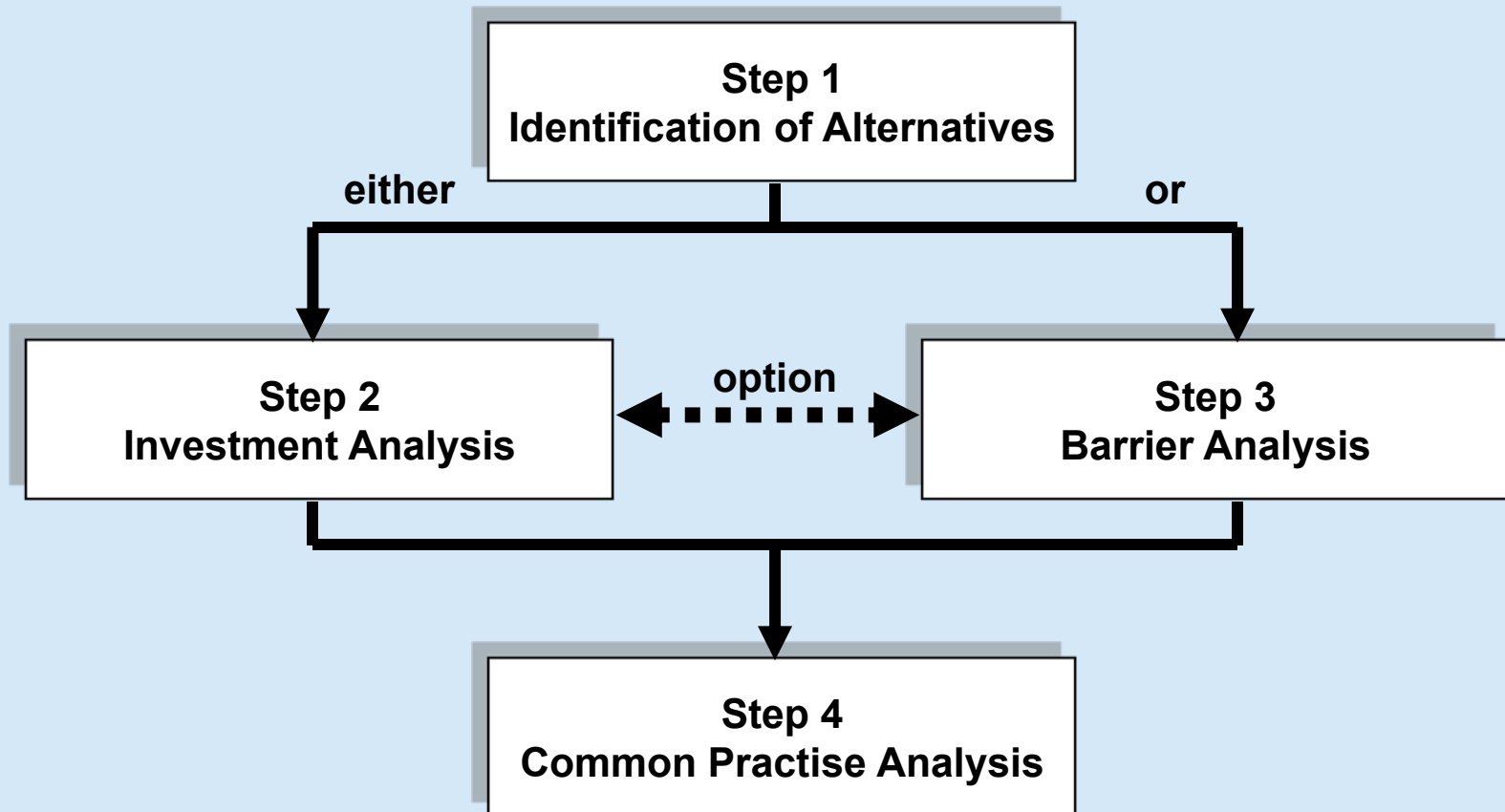
▶ Article 12 (5) of the Kyoto Protocol

Emission reductions resulting from each project activity shall be certified by OEs to be designated by the COP/MOP on the basis of:

- a) Voluntary participation approved by each Party involved;
- b) Real, measurable, and long-term benefits related to the mitigation of climate change; and
- c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

ADDITIONAL ⇔ NOT BUSINESS AS USUAL

► Demonstration and Assessment of Additionality



► Key Questions

**Step 1
Identification of Alternatives**

Are there any alternatives to the CDM-project?

**Step 2
Investment Analysis**

Is the CDM-project financially attractive?

**Step 3
Barrier Analysis**

Are identified alternatives prevented by at least one of the identified barriers?

**Step 4
Common Practise Analysis**

Can similar activities be observed?

► Substeps of Step 1

Subtask 1a Define alternatives

- 1. Project without CDM registration**
- 2. Other alternatives with comparable outputs**
- 3. Continuation of the current situation**

Subtask 1b Check legal compliance

- 1. Are alternatives in compliance with the mandatory legal framework?**
- 2. Is legal framework systematically not enforced or is non-compliance widespread?**
- 3. Is the proposed project activity the only alternative which is in legal-compliance?**

► Key Questions

Step 1
Identification of Alternatives

Are there any alternatives to the CDM-project?

Step 2
Investment Analysis

Is the CDM-project financially attractive?

Step 3
Barrier Analysis

Are identified alternatives prevented by at least one of the identified barriers?

Step 4
Common Practise Analysis

Can similar activities be observed?

► Substeps of Step 2

**Subtask a
Selection of Method**

**Simple Cost (I), Investment Comparison (II)
or Benchmark Analysis (III)**

**Subtask b
Application of Method**

**Revenues only from CERs ⇒ Option I
If other Revenues ⇒ Option II or III**

**Subtask c
Calculation of Indicators**

**IRR, NPV, and/or Product-Specific Costs
(only for Option II and III)**

**Subtask d
Sensitivity Analysis**

Reasonable Variations of Critical Parameters

► Substeps of Step 2

**Subtask a
Selection of Method**

**Simple Cost (I), Investment Comparison (II)
or Benchmark Analysis (III)**

**Subtask b
Application of Method**

**Revenues only from CERs ⇒ Option I
If other Revenues ⇒ Option II or III**

**Subtask c
Calculation of Indicators**

**IRR, NPV, and/or Product-Specific Costs
(only for Option II and III)**

**Subtask d
Sensitivity Analysis**

Reasonable Variations of Critical Parameters

► Definition of IRR and NPV

IRR

is that interest rate which generates a NPV of zero (NPV=0)!

NPV

is the sum of the present values of the investment and all future cash outflows and cash inflows (discounted cash-flows)

Year	0	1 - 10
Investment	- 700	-
O&M	-	- 40
Sale of Electricity	-	+210
Σ	- 700	+170

$$\text{NPV}(0) = +1,000$$

$$\text{NPV}(\infty) = - 700$$

► Alternative Calculation of IRR

**Option II
Investment Comparison Analysis**

either Project IRR or Equity IRR !

**Option III
Benchmark Analysis**

only Project IRR ! *

- * However, if there is only one potential project developer (e.g. when the project activity upgrades an existing process), the IRR **shall** be calculated as **Equity IRR!**

► Definition of Project IRR and Equity IRR

Project IRR

calculates a return based on project cash out- and inflows only, irrespective of the source of financing

Equity IRR

calculates a return to equity investors and therefore also considers the cash out- and inflows of debt financing

Project IRR \neq Equity IRR

► Calculation of NPV (before tax)

Year	0	1 - 10
Investment	- 700	-
O&M	-	- 40
Sale of Electricity	-	+210
Σ before tax	- 700	+170

- ▷ NPV (25%) \Rightarrow - 93
- ▷ NPV (20%) \Rightarrow +13
- ▷ NPV (0%) \Rightarrow +1.000

▷ NPV (20%) > 0 \Rightarrow CDM-project is economically attractive !

► Calculation of NPV (with tax)

	0	1 - 10
Σ before tax	-700	170
Depreciation	-	-70
Revenues	-	100
Tax (30%)	-	-30
Σ after tax	-700	140

► NPV (25%)	⇒	- 200
► NPV (20%)	⇒	- 113
► NPV (15%)	⇒	+ 3
► NPV (0%)	⇒	+700

► NPV (20%) < 0 ⇒ CDM-project is economically not attractive !

► Calculation of NPV (before and after tax)

before tax

▷ NPV (25%) ⇒ - 93

▷ NPV (20%) ⇒ +13

▷ NPV (15%) ⇒ +153

after tax

▷ NPV (25%) ⇒ - 200

▷ NPV (20%) ⇒ - 113

▷ NPV (15%) ⇒ + 3

	project-based	equity-based
before tax	IRR ₁	IRR ₂
after tax	IRR ₃	IRR ₄

▶ Assessment of IRR

- ▷ **IRRs should be as high as possible!**
- ▷ **IRR should be at least higher than a threshold**

Thresholds are company and project specific, i.e.

- Projects with high risks need higher IRRs
- Investors with attractive alternatives ask for higher IRRs



► Dependencies of IRR-Thresholds

Vary with

- ▷ fraction λ of the total capital obtained from debt
- ▷ effective income tax rate t
- ▷ interest rate of dept financing i_{debt}
(measured e.g. from appropriate bond rates)
- ▷ yield of equity financing i_{equity}
(measured from historical performance)

► IRR from 1926 – 2002 on 5 Types of Securities

Type of Security	Average IRR [%]	Standard Deviation of IRR [%]
Treasury bills	3.8	4.4
Long-term U.S. Bonds	5.8	9.4
Corporate Bonds	6.2	8,7
S&P 500 Stocks	12.2	20.5
SME Stocks	16.9	33.2

- Benchmarks for debt financing ⇒ 6 %
- Benchmarks for equity financing ⇒ 17%

► Minimum attractive IRR

$$\begin{aligned} \text{IRR}_{\text{at, min}} &= \text{weighted average cost of capital} \\ &= \lambda (1 - t) i_{\text{debt}} + (1 - \lambda) i_{\text{equity}} \end{aligned}$$

$$\text{IRR}_{\text{bt, min}} \approx \text{IRR}_{\text{at, min}} / (1 - t)$$

$$\lambda = \text{debt}/(\text{debt}+\text{equity}) = 0,8 \quad | \quad t = 0,4 \quad | \quad i_{\text{debt}} = 6\% \quad | \quad i_{\text{equity}} = 17\%$$

λ	after tax	before tax
0.8	0,0628	0,1432
0.2	0,1047	0,2387

► Key Questions

**Step 1
Identification of Alternatives**

Are there any alternatives to the CDM-project?

**Step 2
Investment Analysis**

Is the CDM-project financially attractive?

**Step 3
Barrier Analysis**

Are identified alternatives prevented by at least one of the identified barriers?

**Step 4
Common Practise Analysis**

Can similar activities be observed?

► Substeps of Step 3

Subtask 3a Identify barriers

- 1. Investment barriers**
- 2. Technological barriers**
- 3. Newcomer barrier**
- 4. Other barrier**

Subtask 3b Assess barriers

Explain how the identified barriers are not preventing the implementation of at least one of the alternatives (less strong impact)

► Key Questions

**Step 1
Identification of Alternatives**

Are there any alternatives to the CDM-project?

**Step 2
Investment Analysis**

Is the CDM-project financially attractive?

**Step 3
Barrier Analysis**

Are identified alternatives prevented by at least one of the identified barriers?

**Step 4
Common Practise Analysis**

Can similar activities be observed?

► Substeps of Step 4

Subtask 4a
Analyse similar* activities

- 1. Provide an analysis**
- 2. Provide documented evidence**
- 3. Describe market penetration**

Subtask 4b
Discuss analysis

Why does the existence of these activities not contradict the claim that the proposed project activity is financially unattractive or subject to barriers?

Note: Projects are considered as similar, if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc..

► Summary

- EB has developed 6 CDM tools
- Additionality tool is most frequently used tool
- Additionality is a mandatory project requirement
- Financial and barrier analysis are key elements and alternatives
- Financial indicators (IRR, NPV) need careful consideration
- Project and equity IRR shall be distinguished
- IRR before and after tax should be distinguished

► TÜV Rheinland Group

Competence Centre Climate Change**
Am Grauen Stein
D-51105 Cologne (Germany)

Beijing Office* Unit 707, AVIC Bldg.,
No.10B, Central Road, East 3rd Ring Road
Chaoyang District, Beijing, 100022 (P.R. China)

Office Contact	Beijing*	Cologne**	Cologne**
Phone	Jing Fang	Prof. Dr. Günter Schock	Dipl.-Ing. You. Cui
Fax	+86 10 6566 6660 ext. 141	+49 (0)221 8061733	+49 (0)221 8061733
e-mail	+86 10 6566 6667	+49 (0)221 806 1349	+49 (0)221 806 1349
	Jing.Fang@bj.chn.tuv.com	schock@de.tuv.com	you.cui@de.tuv.com