The REDD+ matrix: a pragmatic solution for countries with low monitoring capacities

Frédéric Achard, **Giacomo Grassi, Michael Bucki** & al

Institute for Environment and Sustainability
Joint Research Center (JRC)

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Assessing REDD+ performance of countries with low monitoring capacities: the matrix approach

M Bucki[1], D Cuypers[2], P Mayaux[3], F Achard[3], C Estreguil[3] and G Grassi[3]

[1] Directorate-General Climate Action, European Commission, B-1049 Brussels, Belgium
[2] Unit Transition, Energy and Environment, VITO, Boeretang 200, 2400 Mol, Belgium
[3] Institute for Environment and Sustainability (IES), Joint Research Center (JRC), Via E Fermi 2749, I-21027 Ispra (VA), Italy

E-mail: Michael.Bucki@ec.europa.eu

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Introduction

Until now, a major share of readiness efforts are allocated into MRV of forest carbon stocks (on average 40% according to World Bank and UN-REDD)

Focusing readiness phase too much on "accurate MRV" might lead to a REDD+ mechanism which works well only for a few countries.

Is it possible setting up simplified monitoring/reporting requirement allowing to join REDD+ also to those Parties with limited forest monitoring capacity?

IPCC basics to estimate forest C stock changes

Emissions = activity data (**AD**) x emission factor (**EF**)

Approach for activity data: Area change
1. total area for each land use category, but no information on conversions (only net changes)
2. tracking of conversions between land-use categories (only between 2 points in time)
3. spatially explicit tracking of land-use conversions over time

Tiers for emission factors: Change in C stocks
1. IPCC default factors
2. Country specific data for key factors
3. Detailed national inventory of key C stocks, repeated measurements of key stocks through time and modeling

Six land use classes: Forest land, Cropland, Grassland, Wetlands, Settlements, Other lands

Methods to estimate C stock changes:
Gain-Loss: growth – harvest – other losses (in theory for all tiers)
Stock Change: difference of C stock over time (tier 2/3 for land use remaining the same, all tiers for land use changes)

IPCC guidance requires tier-2/3 methods for emission factors in "Key Categories"
(likely including deforestation and degradation in most developing countries)

However, most developing countries seems not ready yet for tier 2 or 3

How REDD+ activities would fit into IPCC land uses?

From \ to	Forest Land	Other Land
Forest Land	Forest Degradation Forest conservation Sustainable Management of Forests Enhancement of carbon stocks	Deforestation
Other Land	Enhancement of carbon stocks (Afforestation / Reforestation)	

Stock change method: C before – C after

Gain-loss: growth – harvest – other losses

Difficult to get data

IPCC (very uncertain)

FAOSTAT: very difficult to get the right data!

It is unlikely to estimate C stock changes from degradation with tier 1 !

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Don't forget forest degradation!

Estimates of carbon emissions from forest degradation (expressed as an additional percentage to the emissions from deforestation)

Study Area	Additional emissions due to forest degradation	Reference
Humid tropics	+6%	Achard *et al* 2004
Brazilian Amazon, Peruvian region	+25-47%	Asner *et al* 2005
Tropical regions	+29%	Houghton 2003
South East Asia	+25-42%	Houghton and Hackler 1999
Tropical Africa	+132%	Gaston *et al* 1998

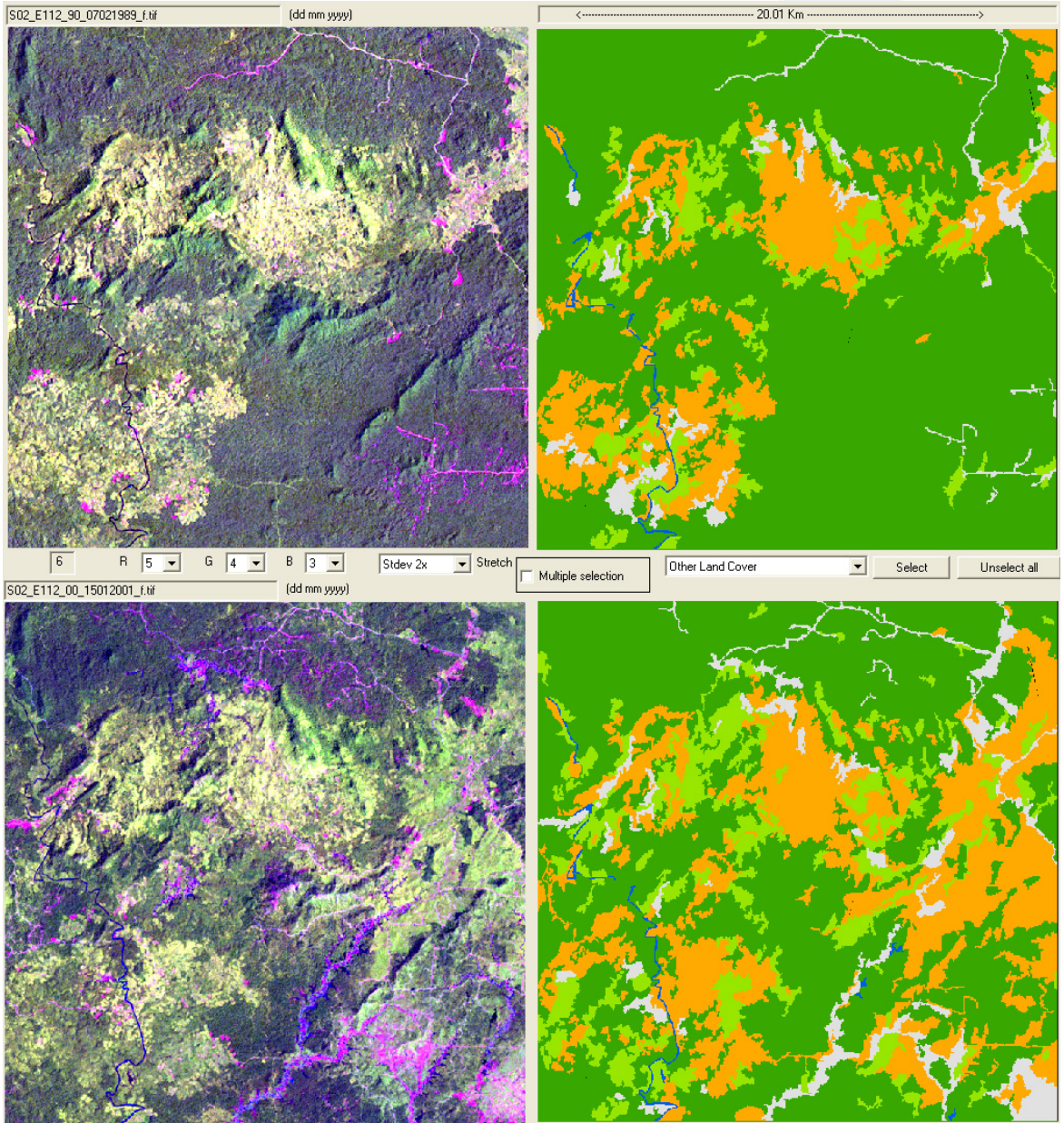
Modified IPCC land use transition matrix

From \ To		Forest land		Other Land
		"Intact (natural) Forest"	"non-intact Forest"	
Forest land	"Intact (natural) Forest"	Forest conservation	Forest Degradation	Deforestation
	"non-intact Forest"	Enhancement of C stocks (forest restoration)	Sustainable Management of Forests	Deforestation
Other Land		-	Enhancement of C stocks (A/R)	

Stock change method: C before – C after

Gain-loss: growth – harvest – other losses

How to map “non – intact” forests?



TREES-3
Forest cover change
Assessment

Indonesia
Kalimantan

Logging and Forest
Conversion
(1990-2000 period)

Spatial pattern approach to identify “exposed forests” as proxy to “non-intact forests”

Among different possible approaches, we consider that “forest edges” may be used as a simple and pragmatic proxy to identify non-intact areas (“exposed forests”), or at least may be a first step to be complemented by other more accurate (and more costly) approaches (i.e. high-resolution RS).

The underlying assumption is that forests that are sufficiently remote from non forested areas (i.e. at a certain distance from roads, navigable waters, crops, grasslands, mines, etc.) are protected against significant anthropogenic degradation.

Example of identification of “exposed forests”

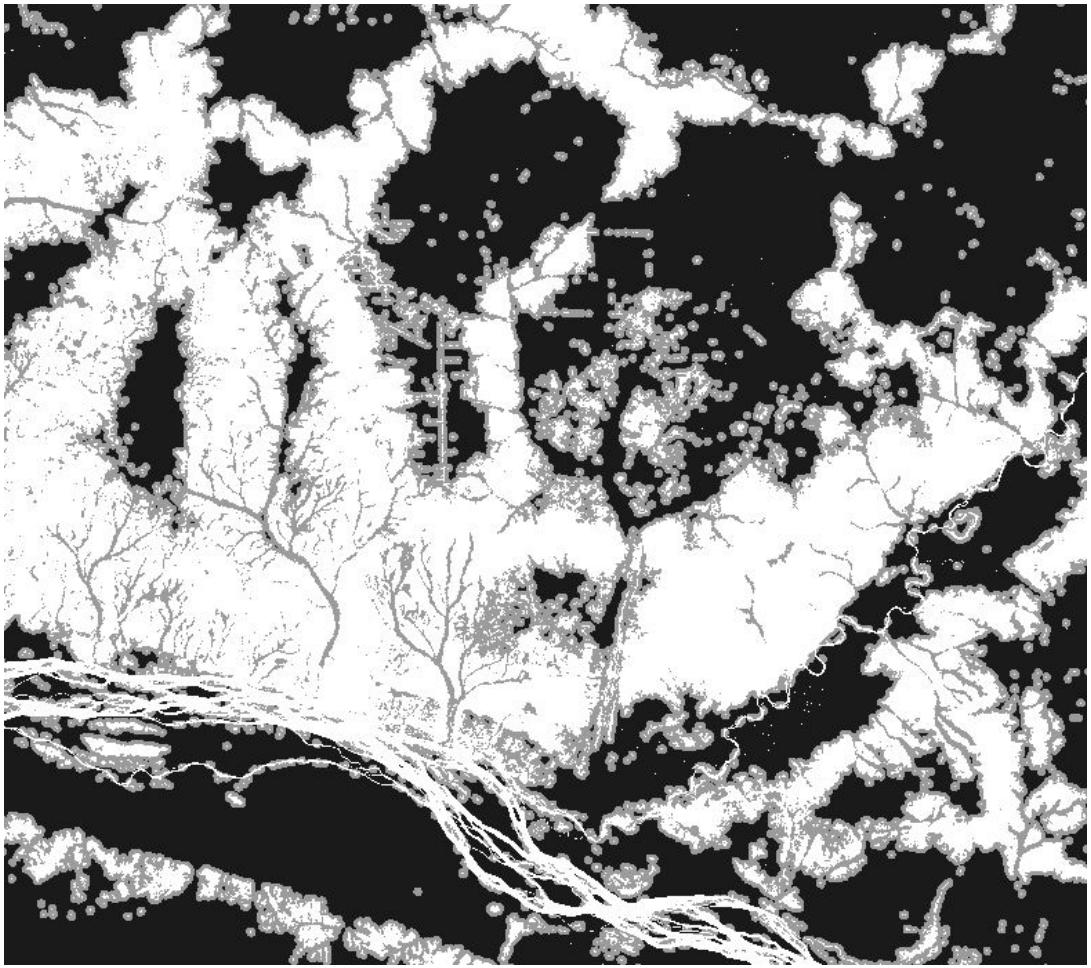
- Input: **Binary forest maps (FACET)**

- Resolution: 60x60 m².

- Treatment: **Morphological Spatial Pattern Analysis** (MSPA).

- Biome specific: Rainforest in Congo Basin (Edge size=500m).

- Could as well be called « exposed », « potentially degraded », « managed » or simply « other » forests.

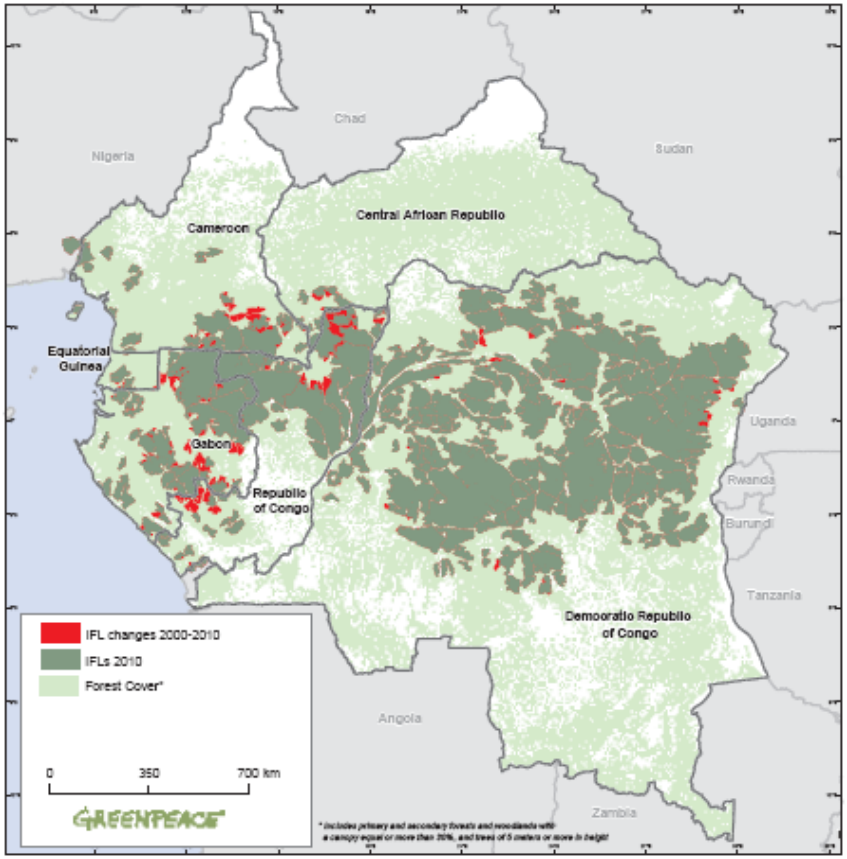


Example of use of “intact forest Landscape” concept
As proxy for intact (natural) forests

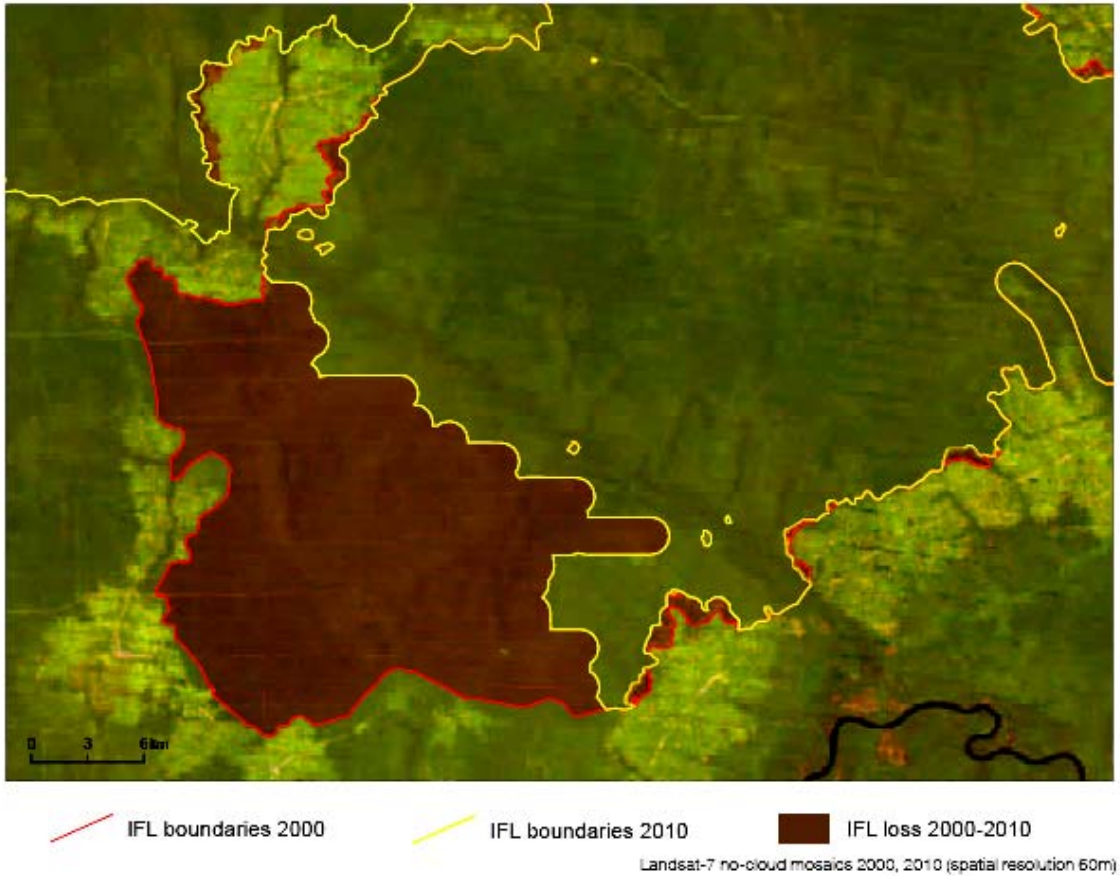
Maps of changes in IFLs in Congo basin:

- from 2000 to 2005
- from 2005 to 2010

Reference:
Thies et al., Intact forest landscapes: Case study: the Congo basin, Greenpeace 2011



Example of use of “intact forest Landscape” concept



Case study in Democratic Republic of Congo

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Area transition matrices for one biome (Congo rainforests), 000 ha

a) 2000-2005

	NF 2005	NIF 2005	OL 2005	Total 2000
NF 2000	62,869	587	36	63,492
NIF 2000	-	39,610	327	39,937
OL 2000	0	-	125,011	125,011
Total 2005	62,869	40,197	125,374	228,440

b) 2005-2010

	NF 2010	NIF 2010	OL 2010	total 2005
NFL 2005	62,273	538	57	62,869
NIF 2005	-	39,559	638	40,197
OL 2005	0	-	125,374	125,374
Total 2010	62,273	40,097	126,069	228,440

NF = Natural Forest land. NIF = Non Intact Forest Land. OL = Other Land

Note: Available input maps did not reflect Afforestation, Reforestation or Restoration, for methodological purposes the shaded cells could therefore not be properly computed and were left blank.

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Area based hypothetical Reference level

European Commission

		Deforestation (in 5 yrs)		Degrad. (5 yrs)	Sust. Manag.	Conserv.
		NF to OL	*NIF to OL*	*NF to NIF*	*NIF to NIF*	*NF to NF*
Area (10^3 ha)	Historical 2000-2005	36	327	587	39,610	62,869
		+50%	+50%	+100%		
	Ref. Level 2005-2010	=	=	=	39,706	61,641
		54	491	1,173		
	Actual 2005-2010	57	638	538	39,559	62,273
	Difference (Actual - RL)	**+3**	**+147**	**-635**	**-147**	**+632**

NF = Natural/Intact Forest land. NIF = Non Intact Forest land. OL = Other Land

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Estimating C stock changes for REDD activities

Once the transition matrix for AD is done, each AD need to be multiplied by the relevant EF, to get C stock change for each REDD+ activity.

If tier 1 EF are to be used, it would require *asking IPCC to produce estimates of C stocks (by forest / climate type) for:*

- ***"intact forest" (values already existing)***
- ***"non intact forests" (from the literature).***

This will allow to derive estimate of <u>C stock changes + uncertainty estimates</u> for Deforestation and Degradation.

<u>The proposed approach requires that the same tier-1 EF</u> (stratified by forest & climate type) <u>are used in both RL and in the accounting period</u>

-> This means that the errors of EF in the Ref Lev and accounting period are fully "correlated".

		Deforestation (in 5 yrs)		Degrad. (5 yrs)	Sust. Manag.	Conserv.	Total
		NF to OL	*NIF to OL*	*NF to NIF*	*NIF to NIF*	*NF to NF*	
Area (10^3 ha)	**Difference Actual - RL**	**+3**	**+147**	**-635**	**-147**	**+632**	**0**
C losses (-), tC/ha [(a)]		**-150**	**-73**	**-78**			
C increment (+), tC/ha/yr					**1.6**	**0.5**	
Cumulated credits(+) or debits (-) in 2010, MtC [(b)]		**-0.4**	**-10.6**	**49.2**	**-1.1**	**1.5**	**38.6**

NF = Natural/Intact Forest land. NIF = Non Intact Forest Land. OL = Other Land

(a) Assuming the following values of biomass carbon stocks: NFL: 155 tC/ha (IPCC 2006); EFL: NFL/2 (or 50% degradation on average in exposed forests); OL: 5 tC/ha.

(b) Calculated as the difference in area (Actual minus RL) multiplied by the C stock change

Taking uncertainties into account

We obtained an estimate of C stock changes for all REDD activities (accounting period - RL) obtained with adequate methods for AD but un-adequate methods for EF (tier 1 instead of tier 2/3)

	NF	NIF	OL
Tier-1 C stocks (tC/ha)	155	78	5
Uncertainty % [1]	*50%*	*75%*	*50%*

	NF to OL	NIF to OL	NF to NIF
Tier-1 C stock change (tC/ha)	150	73	78
Uncertainty % [1]	*52%*	*80%*	*125%*

NFL = Natural/Intact Forest land. NIF = Non Intact Forest Land. OL = Other Land

[1] At 95% confidence interval

When the uncertainties above are combined, total uncertainty of the emission reduction becomes 99%

How to consider that this country used tier 1 EF for key category?

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As part of the Kyoto Protocol review process, the UNFCCC has approved **conservativeness factors** linked to specific uncertainty ranges. Essentially, these factors consider the **50% confidence interval**

UNITED NATIONS
NATIONS UNIES

UNFCCC

FRAMEWORK CONVENTION ON CLIMATE CHANGE - Secretariat
CONVENTION - CADRE SUR LES CHANGEMENTS CLIMATIQUES - Secrétariat

Working paper No. 2 (2005) 3 May 2005

Background documentation on the conservativeness factors for the completion of the technical guidance on adjustments

Working paper[1]

Table 1. Distribution of conservativeness factors within uncertainty bands

Estimated uncertainty range (%)	Assigned uncertainty band (%)	Conservativeness factors for emissions in the base year and/or removals in a year of the commitment period	Conservativeness factor for emissions in a year of the commitment period and/or removals in the base year
Less than or equal to 10	7	0.98	1.02
Greater than 10 and less than or equal to 30	20	0.94	1.06
Greater than 30 and less than or equal to 50	40	0.89	1.12
Greater than 50 and less than or equal to 100	75	0.82	1.21
Greater than 100	150	0.73	1.37

Conclusions

The REDD+ matrix uses simple and flexible concepts (adaptable to country circumstances), allowing to estimate C stock change from Deforestation and forest Degradation even using tier 1 IPCC values.

The application of a conservative discount to those tier-1 estimates increases the credibility of any possible claim of credit.

The simplicity and cost-effectiveness of this approach may allow:

- **Broadening the participation to REDD+, allowing to join also those countries with limited forest monitoring capacity**
- **Increasing the credibility of emission reductions estimated with tier-1, while maintaining strong incentives for further increasing the accuracy of the estimates, i.e. to move to higher tiers.**
- **Allow resource savings which can be reallocated to tackle the drivers of deforestation.**

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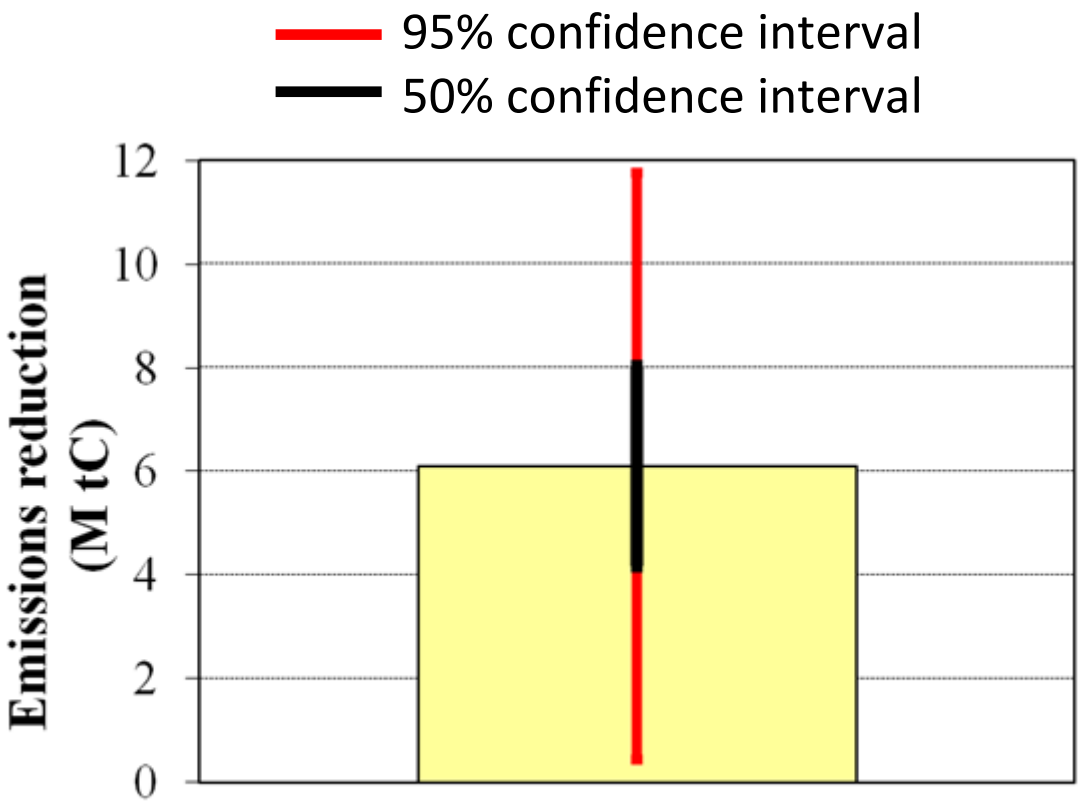

In our case study, by discounting the emissions reduction by about 30% (following the approach of KP review), the **risk of overestimating the reduction of emissions is significantly reduced**